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THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,
INCLUDING
ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY
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AND
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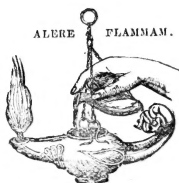
"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRÜCKNER, *Théorie du Système Animal*, Leyden, 1767.

. The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

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A6
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v. 20



CONTENTS OF VOL. XX.

[SEVENTH SERIES.]

NUMBER CXV.

| | Page |
|---|------|
| I. New African <i>Saturniide</i> . By the Hon. L. W. ROTHSCHILD, Ph.D. | 1 |
| II. A Contribution to the Knowledge of the Hymenoptera of the Oriental Zoological Region. By P. CAMERON | 10 |
| III. On Three new Mammals from South Africa. By R. C. WROUGHTON | 31 |
| IV. Descriptions of new Species of African Spiders and <i>Solifuge</i> . By A. S. HIRST | 33 |
| V. Remarks on Prof. L. von Méhely's Paper "Zur Lösung der 'Muralis-Frage.'" By G. A. BOULENGER, F.R.S. | 39 |
| VI. Description of a new Engystomatid Frog of the Genus <i>Breviceps</i> from Namaqualand. By G. A. BOULENGER, F.R.S. (Plate II.) | 46 |
| VII. Descriptions of a new Toad and a new Amphisbænid from Mashonaland. By G. A. BOULENGER, F.R.S. (Plate III.) | 47 |
| VIII. Description of a new Cichlid Fish from Portuguese East Africa. By G. A. BOULENGER, F.R.S. | 50 |
| IX. Descriptions of Three new Freshwater Fishes discovered by Mr. G. L. Bates in South Cameroon. By G. A. BOULENGER, F.R.S. | ib. |
| X. The <i>Atractylis coccinea</i> of T. S. Wright. By E. S. RUSSELL, M.A. | 52 |
| XI. On the Generic Position of Benson's <i>Helix hyba</i> and the Similarity of its Anatomy to that of <i>Khasiella vidua</i> , W. T. Blanford. By Lt.-Colonel H. H. GODWIN-AUSTEN, F.R.S. &c. | 55 |
| XII. Descriptions and Records of Bees.—XV. By T. D. A. COCKERELL, University of Colorado | 59 |
| XIII. Notes on the Habits and External Characters of the Solenodon of San Domingo (<i>Solenodon paradoxus</i>). By A. HYATT VERRILL. (Plate IV.) | 68 |
| XIV. On Three new Mammals from British New Guinea. By OLDFIELD THOMAS | 70 |
| XV. New and little-known Eastern Moths. By Colonel C. SWINHOE, M.A., F.L.S., &c. | 75 |
| <i>New Book</i> :—Books and Portraits illustrating the History of Plant Classification | 80 |

NUMBER CXVI.

| | Page |
|---|------|
| XVI. A Contribution to the Knowledge of the Hymenoptera of the Oriental Zoological Region. By P. CAMERON | 81 |
| XVII. On a new Leptolepid Fish from the Weald Clay of South-water, Sussex. By A. SMITH WOODWARD, LL.D., F.R.S. (Plate I.) | 93 |
| XVIII. On new Species of <i>Histeridæ</i> and Notices of others. By G. LEWIS, F.L.S. | 95 |
| XIX. Descriptions of Two new Freshwater Fishes discovered by Dr. W. J. Ansorge in Mossamedes, Angola. By G. A. BOULENGER, F.R.S. | 108 |
| XX. Description of a new Frog discovered by Dr. W. J. Ansorge in Mossamedes, Angola. By G. A. BOULENGER, F.R.S. | 109 |
| XXI. On the African Mongooses usually referred to the <i>Herpestes gracilis</i> Group. By R. C. WROUGHTON | 110 |
| XXII. The Name of the Armenian Wild Sheep. By R. LYDEKKER | 121 |
| XXIII. Descriptions and Records of Bees.—XVI. By T. D. A. COCKERELL, University of Colorado | 122 |
| XXIV. Notes on the American Species of <i>Hesperiidæ</i> described by Plötz. By F. D. GODMAN, D.C.L., F.R.S., &c. | 132 |
| XXV. Function and Form with Reference to the Hand and Foot in Man and Apes. By DUNCAN C. L. FITZWILLIAMS, M.D., Ch.M., F.R.C.S.S. Ed. & Eng., Demonstrator of Anatomy, King's College, London; Casualty Officer, Hospital for Sick Children, Great Ormond Street. (Plate V.)..... | 155 |
| XXVI. On Neotropical Mammals of the Genera <i>Callicebus</i> , <i>Reithrodontomys</i> , <i>Ctenomys</i> , <i>Dasypus</i> , and <i>Marmosa</i> . By OLDFIELD THOMAS | 161 |
| <i>New Book</i> :—Catalogue of the Madreporarian Corals in the British Museum (Natural History). Vol. VI. By H. M. BERNARD, M.A. | 168 |

NUMBER CXVII.

| | |
|---|-----|
| XXVII. Notes from the Gatty Marine Laboratory, St. Andrews.—No. XXVIII. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c. (Plates VI.—VIII.) | 169 |
| XXVIII. Descriptions of apparently new Species and Subspecies of Mammals belonging to the Families <i>Lemuridæ</i> , <i>Cebidæ</i> , <i>Callitrichidæ</i> , and <i>Cercopithecidæ</i> in the Collection of the Natural History Museum. By D. G. ELLIOT, D.Sc., F.R.S.E., &c. | 185 |
| XXIX. On Mammals from Northern Persia, presented to the National Museum by Col. A. C. Bailward. By OLDFIELD THOMAS, F.R.S. | 196 |

| | |
|--|-----|
| XXX. A Subdivision of the Old Genus <i>Nesokia</i> , with Descriptions of Three new Members of the Group, and of a <i>Mus</i> from the Andamans. By OLDFIELD THOMAS | 202 |
| XXXI. On some British Polyzoa. By Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S. (Plate IX.) | 207 |
| XXXII. Three new Spanish Insectivores. By ANGEL CABRERA. | 212 |
| XXXIII. On Four new Pill-Millipedes from the Malay Peninsula and Siam. By A. S. HIRST (British Museum, Nat. Hist.) (Plate X.) | 215 |
| XXXIV. Description of an apparently new Lycænid from Mauritius. By HAMILTON H. DRUCE, F.Z.S., F.E.S. | 219 |
| XXXV. On an Extinct undescribed Fruit-Bat of the Genus <i>Pteropus</i> from the Mascarenes. By GEO. E. MASON | 220 |
| XXXVI. Brachiopod Nomenclature: <i>Seminula</i> , &c. By S. S. BUCKMAN, F.G.S. | 223 |
| XXXVII. On some Freshwater Amphipods: The Reduction of the Eye in a new Gammarid from Ireland. By Prof. Dr. FR. VEJDovsky. (Plates XI. & XII.) | 227 |
| XXXVIII. Observations on the Trematode Parasites of British Birds. By WILLIAM NICOLL, M.A., B.Sc., Gatty Marine Laboratory, St. Andrews | 245 |
| XXXIX. Preliminary Report on the Monaxonellida of the National Antarctic Expedition. By R. KIRKPATRICK | 271 |
| XL. Description of an apparently new Species of Monkey of the Genus <i>Cebus</i> . By D. G. ELLIOT, D.Sc., F.R.S.E., &c. | 292 |
| XLI. On the Occurrence of <i>Acanthoglossus</i> in British New Guinea. By OLDFIELD THOMAS | 293 |
| <i>New Books</i> :—I Go A-Walking. Through the Woods. With Illustrations by CHARLES REID.—Nature in School. No. 2. Edited by BORIS WEINBERG, Priv. Doc. St. Petersburg Univ. . | 295 |

NUMBER CXVIII.

| | |
|---|-----|
| XLII. New South-African Spiders of the Family <i>Drassidæ</i> in the Collection of the South-African Museum. By W. F. PURCELL, Ph.D., Cape Town. (Plates XIII.-XV.) | 297 |
| XLIII. Descriptions of Two new African Species of <i>Barbus</i> . By G. A. BOULENGER, F.R.S. | 336 |
| XLIV. Description of a new Pit-Viper from Brazil. By G. A. BOULENGER, F.R.S. | 338 |
| XLV. On new Species of <i>Histeridæ</i> and Notices of others. By G. LEWIS, F.L.S. | 339 |

| | Page |
|--|---------|
| XLVI. Some Remarks on <i>Pteropus mascarinus</i> , Mason. By KNUD ANDERSEN | 351 |
| XLVII. Notes on the Crustacea of the Channel Islands. By Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S. (Plates XVI. & XVII.) | 356 |
| <i>New Books</i> :—100 Photographs from Life. (No. 1.) By DOUGLAS ENGLISH.—100 Photographs from Life. (No. 2.) By R. B. LODGE.—Les Débuts d'un Savant Naturaliste, le Prince de l'Entomologie, Pierre André Latreille, à Brive, de 1762 à 1796. Par LOUIS DE NUSSAC, Sous-Bibliothécaire du Museum d'Histoire naturelle.—EDM. BORDAGE. Recherches anatomiques et biologiques sur l'Autotomie et la Régénération chez divers Arthropodes.—The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by Lt.-Col. C. T. BINGHAM. Butterflies. Vol. II. By Lt.-Col. C. T. BINGHAM | |
| Proceedings of the Geological Society | 374—376 |

NUMBER CXIX.

| | |
|--|-----|
| XLVIII. Preliminary Notice of new and remarkable Cephalopods from the South-west Coast of Ireland. By A. L. MASSY, Department of Agriculture and Technical Instruction, Fisheries Branch, Dublin | 377 |
| XLIX. On the Geographical Races of the Lesser Horseshoe Bat (<i>Rhinolophus hipposiderus</i>). By KNUD ANDERSEN | 384 |
| L. Some new European Insectivora and Carnivora. By GERRIT S. MILLER | 389 |
| LI. Two new Forms of the Spanish Hare. By GERRIT S. MILLER | 398 |
| LII. Description of Two new Characinid Fishes from South America. By C. TATE REGAN, M.A. | 402 |
| LIII. Note on <i>Raia undulata</i> , Lacep. By C. TATE REGAN, M.A. | 403 |
| LIV. On a new Hare from the Transvaal. By H. LYSTER JAMESON | 404 |
| LV. On a new Dormouse from Asia Minor, with Remarks on the Subgenus " <i>Dryomys</i> ." By OLDFIELD THOMAS | 406 |
| LVI. Notes on an " <i>Octopus</i> " with Branching Arms. By EDGAR A. SMITH, I.S.O., F.Z.S. (Plate XVIII.) | 407 |
| LVII. Rhynchotal Notes.—XLIII. By W. L. DISTANT | 411 |
| LVIII. Description of a new Genus and Species of <i>Ceranbycidae</i> from Natal. By W. L. DISTANT. | 423 |
| LIX. Description of a new Species of <i>Cicadidae</i> from East Africa. By W. L. DISTANT. | 425 |

| | Page |
|--|------|
| LX. Four new European Squirrels. By GERRIT S. MILLER, . . . | 426 |
| LXI. New Species of African and Indo-Malayan <i>Hesperidæ</i> . By Colonel C. SWINHÖE, M.A., F.L.S., &c. | 430 |
| LXII. The Significance of the Pattern of the Cubs of Lions (<i>Felis leo</i>) and of Pumas (<i>Felis concolor</i>). By R. I. Pocock, F.L.S., F.Z.S., Superintendent of the Zoological Society's Gardens. (Plates XIX. & XX.) | 436 |
| LXIII. Descriptions and Records of Bees.—XVII. By T. D. A. COCKERELL, University of Colorado | 445 |
| <i>Echinocrinus</i> versus <i>Archæocidaris</i> , by F. A. Bather, British Museum (Nat. Hist.) | 452 |

NUMBER CXX.

| | |
|---|-----|
| LXIV. A Revision of the Medusæ belonging to the Family <i>Laodiceidæ</i> . By EDWARD T. BROWNE, University College, London. | 457 |
| LXV. On new Species of <i>Histeridæ</i> and Notices of others. By G. LEWIS, F.L.S. | 480 |
| LXVI. Descriptions of Three new Freshwater Fishes discovered by Mr. G. L. Bates in South Cameroon. By G. A. BOULENGER, F.R.S. | 485 |
| LXVII. Descriptions of Three new Fishes from Central Africa. By G. A. BOULENGER, F.R.S. | 487 |
| LXVIII. Description of a new African Snake of the Genus <i>Simocephalus</i> . By G. A. BOULENGER, F.R.S. | 489 |
| LXIX. Descriptions of new Species of Land and Freshwater Shells from Central and South America. By H. B. PRESTON, F.Z.S. | 490 |
| LXX. A new <i>Acanthoglossus</i> from the Island of Salawatti. By OLDFIELD THOMAS | 498 |
| LXXI. Description of a new Baboon from British East Africa. By D. G. ELLIOT, D.Sc., F.R.S.E., &c. | 499 |
| LXXII. List of a Collection of small Mammals made by Mr. A. L. Butler in the Bahr-el-Ghazal. By R. C. WROUGHTON | 500 |
| LXXIII. Descriptions of Five new Species of Heterocera. By HERBERT DRUCE, F.L.S. &c. | 505 |
| LXXIV. New African Species of the Genus <i>Chrysops</i> , Meigen, in the British Museum (Natural History). By ERNEST E. AUSTEN | 507 |
| LXXV. Descriptions of Two new Species of <i>Plecotus</i> . By G. E. H. BARRETT-HAMILTON | 520 |
| LXXVI. Description of a new Species of Monkey (<i>Cercopithecus Hamlyni</i>) from the Ituri Forest. By R. I. Pocock, F.L.S., Superintendent of the Zoological Society's Gardens | 521 |

| | Page |
|---|----------|
| LXXVII. A new Flying-Squirrel from Formosa. By OLDFIELD THOMAS | 522 |
| LXXVIII. Notes on Two Species of African Freshwater Sponges. By R. KIRKPATRICK | 523 |
| <i>New Books</i> :—Memoirs of the Department of Agriculture in India (Entomological Series).—Homoptera Andina: Die Zikaden des Kordilleregebietes von Südamerika nach Systematik und Verbreitung, von A. JACOBI. I. <i>Cicadidae</i> .—Précis des Caractères génériques des Insectes, disposés dans un ordre naturel par le Citoyen Latreille | |
| | 525, 526 |
| Index | 527 |

PLATES IN VOL. XX.

| | |
|----------|---------------------------------------|
| PLATE I. | Leptolepis valdensis. |
| II. | Breviceps macrops. |
| III. | Bufo anotis. |
| IV. | San Domingo Solenodon. |
| V. | Hand and foot of Hylobates agilis. |
| VI. | Head of porbeagle shark. |
| VII. | Ommastrephes sagittatus. |
| VIII. | Nereis diversicolor. |
| IX. | British Polyzoa. |
| X. | Pill-Millipedes. |
| XI. | { Freshwater Amphipods. |
| XII. | |
| XIII. | { South-African spiders. |
| XIV. | |
| XV. | |
| XVI. | { Crustacea from the Channel Islands. |
| XVII. | |
| XVIII. | Octopus with branching arms. |
| XIX. | { Lion and puma cubs. |
| XX. | |

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

"..... per litora spargite muscum,
Naiades, et circum vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettusi, Ecl. 1.

No. 115. JULY 1907.

I.—*New African Saturniidæ.*
By the Hon. L. W. ROTHSCHILD, Ph.D.

1. *Epiphora pelosoma*, sp. n.

Body clay-colour; upperside of thorax hair-brown; meta-notum, upperside of last abdominal ring, two thin ventral lateral lines, and a spot on the breast white.

Upperside of wings dark hair-brown, slightly pinkish outside the discal band, yellow at the outer margin; eye-spots as in *Antinorii*, but larger. Fore wing with a white, subbasal, angle-shaped band and a narrow white discal band, the latter being nearly straight from costal margin to middle and then slightly incurved; apex of wing red. On hind wing a white subbasal and a white discal band, joining each other in front.

Underside washed with clay-colour, the disk of both wings densely dusted with white outside the discal band; the latter on hind wing continued along costal margin to base.

Length of fore wing 70 mm.

Uluguru Mts., German East Africa; one female in the Tring Museum.

Ann. & Mag. N. Hist. Ser. 7. Vol. xx.

2. *Epiphora rectifascia*, sp. n.

Body blackish brown; antenna, head, and legs clay-colour; edges of the abdominal segments yellow; metanotum white.

Upperside of wings dark hair-brown, the distal margin olive, preceded by yellow spots. Fore wing falcate, a sub-basal band white, forming an angle of 90° ; eye-spot as in *mythimnia*, but longer; a straight white discal band, sharply defined; outside the same and along costal margin white dusting. Hind wing with a basal and a discal band, both white and slightly curved; eye-spot large, incurved between the first and second radials; disk outside the band pinkish, as on fore wing, and dusted with white.

Length of fore wing 80 mm.

Yakusu, Stanley Falls, Congo (*J. L. Roger*); one male in the Tring Museum.

3. *Imbrasia aethiops*, sp. n.

Nearest to *I. rubrocostalis*, Kirby (1892).

Upperside of head, thorax, and wings brownish black; abdomen fulvous. Fore wing with a trace of a grey discal line ending close to apex in a small costal patch; ocellus represented by a transparent semicrescent, which is larger than in *rubrocostalis*, but very much smaller than in *Mitfordi*, Kirby (1892), being thinly edged with fulvous. Costal area of hind wing rosy red from base to middle and backwards as far as anterior edge of cell; ocellus consisting of a deep drab outer ring, followed internally by a black ring which encircles an ochraceous iris, bearing a small transparent pupil; no discal line.

Underside paler than upper, outer margin of fore wing and the whole hind wing shaded with grey; on disk of fore wing near margin a straight but indistinct blackish band, the hind wing bearing a likewise blackish shadowy median band and a discal line, the latter reaching costal margin close to angle.

Cameroons; one male in the Tring Museum.

4. *Imbrasia cytherea lucida*, subsp. n.

Smaller than South-African *cytherea*. Resembling yellow specimens of the same, but the head, collar, metanotum, and breast purer rosy red, the basal half or two thirds of the underside washed with rosy red, the brown bands and the ocelli edged with dark grey-brown, which is usually almost

of the same colour as the brown discal line, instead of being nearly white as in *cytherea*, the ocelli almost the same size on fore and hind wing, being much smaller on the hind wing than in *cytherea*.

Langenburg, Lake Nyassa, German East Africa; a series in the Tring Museum.

5. *Imbrasia anthina xanthomma*, subsp. n.

Ochraceous or red-brown. Fore wing more strongly falcate than in *anthina*, the discal band nearer the margin, the yellow ocellus without transparent centre, or the transparent spot minute; the grey submarginal area of the hind wing more extended, being on the underside also less dentate.

Gold Coast and Sierra Leone; several males and one female in the Tring Museum; a female from Tafo, Gold Coast, in the British Museum.

6. *Imbrasia Gueinzii nyassana*, subsp. n.

Smaller than *Gueinzii*, less uniformly yellow; the submedian band of the fore wing more strongly zigzag, the discal band costally further from the apex, therefore less oblique; the ocellus smaller, being subtriangular, a distinct but shadowy grey submarginal band.

Hind wing more extended rosy red than in *Gueinzii*, the base of the abdomen being also red. On the underside the area between the discal band of the fore wing and the margin costally wider and posteriorly narrower than in *Gueinzii*, and the grey marginal band prolonged to costal margin. On the hind wing the distal marginal area posteriorly less widened than in *Gueinzii*; the transparent spot of both wings smaller and less distinctly edged with yellow.

A series in the Tring Museum from Langenburg, Lake Nyassa, German East Africa.

7. *Imbrasia Wahlbergi rhodina*, subsp. n.

Body and wings varying from tawny ochraceous to reddish tawny, the ground-colour being much deeper than in *Wahlbergi*; the costal area of the hind wing above and sometimes nearly more or less distinctly flushed with rosy red. Ocellus of fore wing smaller than in *Wahlbergi*, proximally less strongly rounded than on the outer side, the pinkish basal patch smaller, the submedian band less sharply dentate, and the pinkish-grey submarginal band much less prominent, as is also the case on the hind wing.

Kigonsera, N.E. of Lake Nyassa, German East Africa ; a small series in the Tring Museum.

8. *Aurivillius tiramis*, sp. n.

The first subcostal of fore wing from the cell. Antenna of male much smaller than in *A. arata*, Westw. (1849), the branches shorter and therefore stiffer, the apical ventral branches of the central segments about as long as the next two segments together, being much shorter than the proximal branches, the dorsal apical branches also shorter than the proximal ones of the same segments. In the female the segments shorter than in *arata*, the branches, which are longer, being therefore closer together.

Smaller than West-African specimens of *arata*. The pattern almost exactly the same as in yellow individuals of *arata*. The tuft at the base of the antenna and the sides of the breast more yellowish ; the second discal line of fore wing thinner and more distinctly dentate ; the marginal area less marked with brown.

Dorsal lobe of anal segment of male narrower than in *arata*, bearing a dentate crest beneath. Apical lobe of clasper long. Penis-funnel with a black dentate club on each side.

Sierra Leone, southward to the Kassai River and Angola.

A. arata occurs also in these districts, but is apparently less frequent.

9. *Gonimbrasia belina occidentalis*, subsp. n.

Nearest to *G. b. osiris*, Druce (1896). Outer margin of fore wing in male more incurved and in female more straight, being usually slightly emarginate. The white scaling along the lines of both wings less dense, this white border to the discal line of fore wing edged by a fuscous or red line. The outer margin of hind wing in male more angulate below centre and the discal line closer to margin ; its white border usually disappearing posteriorly. The ocellus of underside of fore wing not edged with fuscous. The anal tergite of male slenderer than in *osiris* and the processes of the penis-sheath obtuse.

Gambaga, Volta River, Gold Coast Hinterland (*Dr. Bury*) ; a long series in the Tring Museum.

10. *Gonimbrasia melanoneura*, sp. n.

Nearest to *G. acetes*, Westw. (1849). Antenna more shortly pectinated, and only 15 segments bearing side-branches, about 16 distal segments being without them.

Upperside of wings deeper ochraceous than in *acetes*, the distal marginal area narrower, the discal line, especially on the fore wing, standing nearer the margin; the veins black from middle of fore wing to outer margin; the marginal area of fore wing shaded with fuscous both above and beneath, except at hind angle.

On underside there is an olivaceous black double spot at apex of cell on both wings, the inner spot being large and the outer one small. The clasper (of male) obtuse and the anal tergite flattened, not compressed as in *acetes*.

Wassaw district, Gold Coast; one male in the Tring Museum. Another male, also from the Gold Coast, in the Leeds Museum; *acetes* occurring there too.

11. *Lobobuncea Morlandi*, sp. n.

As large as *L. alinda*, Drury (1780).

Upperside of body and wings maize-yellow, the distal margin except fringe white in male and fuscous in female. On fore wing a blackish band just outside apex of cell and in female a lunate band on the disk nearer the margin than the cell. Hind wing without bands on upperside in male, there being two bands in female, one from the ocellus to the abdominal margin, the other about halfway between cell and outer margin.

On underside the discal lunules in female further away from the cell than in *alinda* and the marginal area in both sexes evenly grey, being without brownish blotches; the central line of lunules crossing the wing at tip of cell, being continuous with the olivaceous black central patch, these lunules large.

Pemba Island, East Africa (*E. Morland*); one pair in the Tring Museum.

12. *Melanocera parva*, sp. n.

A little over half the size of *M. menippe*, Westw. (1849).

Body not washed with white on underside; head and prothorax olivaceous brown, there being no white edge to the collar.

Upperside of wings as red as in *menippe*, hardly at all speckled with brown along the outer margin; eye-spots as in *menippe*, but the white lines absent from both wings.

Underside of fore wing pale red, slightly irrorated with brown before outer margin; an extremely faint trace of a discal line. Hind wing less clouded with brown than in

menippe, bearing as in that species on disk a straight white line bordered outwardly with brown.

Length of fore wing 42 mm.

Clasper bisinuate at apex, the upper angle projecting; anal tergite with two acute processes. The segments of the antenna longer than broad, the branches longer than in *menippe*.

Caiala, near Bihé, Angola, 12th October, 1904 (*Dr. W. J. Ansorge*), one male; and another male, also from Bihé: both in the Tring Museum.

PARUSTA, gen. nov.

♂. Antenna cylindrical, flattened at apex, the segments much broader than long, except the last two, each with only one pair of branches, these long and very slender, being short, however, on the last three segments; the apical ventral edge of the distal segments slightly raised, but not produced into a process as in the case of *Usta* and *Pseudantheræa*. Tibiæ normal, without apical thorn-like claws, mid-tibia longer than the first tarsal segment. Neuration similar to that of *Tagoropsis*; fore wing with four subcostals, the first more distal than the fourth, the second very short; first radial and first median at equal distances from the cross-vein; costal margin of hind wing nearly straight, the second median much more proximal than the subcostal.

Nearest to *Tagoropsis*, differing especially in the structure of the antenna and in neuration.

13. *Parusta xanthops*, sp. n.

Cream-buff; the head ochraceous; the antenna deep buff and the abdominal segments brown at the bases and ochraceous at the apical edges. Wings dirty white; on fore wing a patch at base, a broad curved antemedian line continued to base at hind margin, a discal line excurved in centre and there widened to form a patch, partly encircling the ocellus, further an ill-defined marginal band and a portion of the veins brown; the ocellus round, yellow, edged with brownish black. On hind wing a discal and a submarginal band, both ill-defined and nearly parallel to outer margin; ocellus as on fore wing, but smaller.

Underside nearly as upper; discal band of hind wing distinct, widened at the ocellus, submarginal band represented by some ill-defined patches, namely, a costal, a central, and an anal one, the last two being joined together by a faint

line. The eighth ventral ring of abdomen sinuate, the angles being acuminate.

Length of fore wing 27 mm.

Mpwapwa, German East Africa; one male in the Tring Museum.

14. *Tagoropsis sabulosa*, sp. n.

Buff, the head and upperside of the legs being brown-red. Wings almost uniformly irrorated with brown-red scales, which give the wings a pinkish-buff appearance. On fore wing the first and second lines thin, placed as in *T. flavinata*; ocellus small, composed of a vitreous dot encircled by a brown-red line; the discal line curved gently but distinctly towards apex of wing, being costally much more distal than in *T. flavinata*; apex of wing produced; no submarginal spots, but the reddish scaling slightly condensed at the outer side of the discal line. On hind wing two lines, the first placed as in *T. flavinata*, the second costally excurved, posteriorly incurved; the anal angle more prominent than in *T. flavinata*, the distal margin being less rounded.

Underside like upper; the first line of fore wing absent.

The anal tergite black, divided, each lobe compressed. Clasper excised ventrally before apex, the upper lobe projecting, the dorsal edge of clasper biemarginate.

Length of fore wing 46 mm.

Moshi, Kilimandjaro; one male in the Tring Museum.

15. *Tagoropsis lupina*, sp. n.

Ochraceous buff; palpus and fore coxæ vinaceous rufous; upperside of legs rosy. Fore wing with three brown-red lines, the first as in *T. flavinata*, broken at median vein, the second straight across the ocellus, very slightly dentate on the proximal side; the third line also straight, commencing at costal margin 6 mm. from the apex, meeting the second line at inner margin; ocellus composed of a round vitreous spot edged with brown-red. On hind wing a broad evenly curved median line and a vestige of an undulate discal line.

Underside washed with brown-red except the posterior area of the fore wing; the lines as above, but the first line of the fore wing absent.

Length of fore wing 55 mm.

Lokolele, Congo; one female in the Tring Museum.

16. *Pseudaphelia apollinaris barotsina*, subsp. n.

Like *apollinaris*, Boisd. (1847), but the discal line absent from the hind wing.

Barotseland and west side of Lake Nyassa; several specimens in the Tring Museum.

17. *Cyrtogone Ansorgei*, sp. n.

In colour resembling the male of *C. nemia*, Westw. (1849).

Fore wing shorter and broader, non-falcate, non-dentate, the outer margin slightly incurved. Hind wing red at base only; costal margin longer than in *nemia*, outer margin very faintly dentate.

Underside more uniformly irrorated than in *nemia*; fore wing with trace of a postdiscal line; extreme base of hind wing red; tarsi partly also red.

Caiala, near Bihé, Angola, 1st December, 1904 (*Dr. W. J. Ansorge*); one male in the Tring Museum.

18. *Cyrtogone bilineata*, sp. n.

Similar to *C. Ansorgei*, but approaching *nemia* in the shape of the wings, both wings being more distinctly dentate than in *Ansorgei* and the fore wing more falcate.

Upperside of fore wing with two lines as in *Ansorgei*, but the discal line more distinct, especially towards costal margin; between this line and the yellowish-grey blotch which stands at the apex of the cell there is a black shadowy patch extending forward to the costal margin; the outer area more plainly irrorated with blackish brown, as is also the case on the hind wing; the costal area of the latter more extended red.

On underside the disk of the fore wing and the outer area of the hind wing lighter in colour than in *Ansorgei*; the fore wing with a blackish cloud outside the apex of the cell and the discal line ending in a black spot at the costal margin.

Female similar to the male, but the wings much broader, the fore wing without a distinct black cloud on the disk, and the upperside of the hind wing as well as the underside of both wings, the distal margin of the fore wing excepted, much paler. There are no white patches, as is the case in *C. nemia*.

Kidugala, German East Africa; one male and two females in the Tring Museum; a pair from Salisbury, Mashonaland (*G. A. K. Marshall*), in the British Museum.

Perhaps a geographical representative of *Ansorgei*.

19. *Holocera suavis*, sp. n.

Deeper red-brown than *H. smilax*, Westw. (1849).

Fore wing broader, less produced at apex, the central band posteriorly wider, its grey outer border much less curved, being almost straight from costa to middle; the glass-spot consists of a half-ring, to which is joined in front an angle- or inversed comma-shaped spot. Hind wing broader than in *H. smilax*, shorter at abdominal margin, the distal margin slightly convex; the eye-spot as in the species of *Ludia*, yellow, with a thin, black-edged, central half-ring and a black outer border; a pinkish-grey submarginal line extends from close to anal angle forward to the eye-spot, encircling the same and running back to the abdominal margin, this last portion being faint; this line forms the border of a red-brown band as in *Ludia*.

On underside the fore wing washed with grey on the disk outside the vitreous spot from the costal to the abdominal margin; some specks at the costal edge and a thin apical half-ring grey; outer margin, the cell, and part of costal margin olivaceous walnut-brown; on hind wing the basal costal area, a short costal discal band, and the outer margin the same colour, this costal band continued to hind margin as a very thin line.

In female the wings much broader than in the male.

Eighth abdominal segment (of male) without the apical spines found in *H. smilax*.

Larva yellow; the head, prothorax, a ventral lateral stripe, the anus, and on each ring a narrow belt bearing setiferous warts, black, the anterior belts more or less interrupted, none of the belts reaching down to the legs.

Nguelo, Usambara, German East Africa; several specimens in the Tring Museum; also in the British Museum from the same place.

20. *Ludia goniata*, sp. n.

Similar to *Delegorguei*, Boisd. (1847).

Fore wing somewhat longer at inner margin, the apex rather more produced, the distal margin dentate, the brown discal area in male wider than in *Delegorguei*, its outer edge less curved in front and behind, slightly crenulate. Hind wing anteriorly longer, the wing therefore larger, distal margin dentate and below middle distinctly angulate; the outer edge of the brown discal area also angulate, though slightly.

On underside the marginal area of fore wing in male nearly as deep brown as the disk, with a thin grey submarginal line; in female the whitish submarginal shade of both wings more restricted than in *Delegorguei*, and the brown submarginal line more irregular, being slightly angulate below middle.

Natal and Grahamstown; several males and females in the Tring Museum and the British Museum.

21. *Ludia eximia*, sp. n.

Also closely resembling *L. Delegorguei*.

Body and wings more blackish brown; basal, costal, and outer marginal areas shaded with grey, not clay; submarginal line on both wings posteriorly a little less close to edge than in *Delegorguei*, the margin of fore wing densely shaded with blackish above and beneath; costal margin of hind wing longer than in *Delegorguei*, the wing being less triangular.

Ventral lobe of clasper (of male) short and blunt, the apical lobe rounded off, not produced into a thorn-like process.

Kampala, Uganda; one male in the Tring Museum.

II.—*A Contribution to the Knowledge of the Hymenoptera of the Oriental Zoological Region.* By P. CAMERON.

FOR the Indian species described in this paper I am indebted to Col. C. T. Bingham; those from Borneo were sent me by Mr. John Hewitt, the Curator of the Sarawak Museum. I have also described a few species taken by Col. Nurse in Baluchistan and Simla.

Braconidæ.

Iphiaulax Preyeri, sp. n.

Black; the head, antennal scape, thorax, and the four anterior legs red, the middle tibiæ and tarsi darker coloured; the wings fuscous, the nervures and stigma black; the head, metathorax, and legs covered densely with longish blackish pubescence, the ovipositor densely with stiff black hair; the first abdominal segment suffused with rufous, the raised central part almost smooth, the middle with a narrow keel down the centre; the second segment closely but not very strongly striated, the keel narrow, extending to the apex, the base with a small smooth triangular plate; the third is

striated at the base, and there is a triangular striated part on the sides, the apex extending to the base of the apical fourth; there is a keel down the middle of the basal three fourths. Temples as long as the top of the eyes, rounded behind, the occiput almost transverse. Face coarsely rugosely punctured. Antennal scape about three times longer than wide, of equal width, hardly as long as the second joint of flagellum, not hollowed below. Parapsidal furrows shallow. Recurrent nervure interstitial; the third abscissa of radius as long as the basal two united.

Length 10, terebra 17 mm.

Kuching; March (*John Hewitt*).

In size and form this species resembles *I. trichiothecus*, Cam.; the latter may be known by the third and fourth abdominal segments being striated. *I. extraneus*, Cam., has the same abdominal striation, but is a much larger and stouter species, and may be readily separated by the different form of the abdominal plate, which is much longer, gradually narrowed to a point near the middle of the segment.

Iphiaulax eriophorus, sp. n.

Black; the head (except the sides and top of front) and the vertex (except the sides behind, and the hinder central part more narrowly, which are black) dark rufous; the antennal flagellum black; the prothorax bright red; the depression bordering the basal plate of second abdominal segment, its apex broadly in the centre, narrowly on the sides, the centre of the third and fourth segments broadly at the base and apex, more narrowly in the middle, and the greater part of the ventral surface, rufo-testaceous. Median segment and breast thickly covered with white woolly pubescence, that on the latter shorter than on the former. The fore legs and the middle knees broadly rufo-testaceous. Wings hyaline, very iridescent, slightly tinged with fuscous; the costa, stigma, and nervures deep black. ♀.

Length 7, terebra 7 mm.

Kuching; October (*John Hewitt*).

Abdominal segments to near the apex of the fourth finely closely striated; the first segment broad at the base, raised, the sides depressed; the area on the base of second not very clearly defined, striated, narrowed gradually towards the apex, which extends to near the end of the segment; the surrounding parts are much more strongly striated; there is a curved furrow on the sides of the third segment and a transverse crenulated one on the apex. Face covered with white

pubescence, smooth; the oral region bordered laterally by deep wide furrows. There is a distinct malar space about two thirds as long as the antennal scape. Temples wide, only slightly narrowed behind. Parapsidal furrows narrow, deep, clearly defined, reaching from the base to the apex. The third abscissa of the radius fully as long as the basal two united; the recurrent nervure received distinctly before the transverse cubital.

Iphiaulax cosmiothecus, sp. n.

Black; the head, palpi, mandibles (except at apex), prothorax, mesothorax, and metathorax (except the sides of metanotum broadly) red; the fore legs red, darker at the apex. Wings uniformly fuscous violaceous; the second abscissa of radius longer than the third; the legs and sheaths of ovipositor densely covered with stiff black hair; the apex of the sheaths of the ovipositor with a broad band of white hair. On the apical three fourths of the raised part of the first abdominal segment are two stout parallel keels, forming almost a deep furrow; they are united near the base by a weak transverse keel; on the sides are two keels, the outer (and shorter one) commencing at the base, the other shortly beyond it; the basal half of the bordering furrows is stoutly closely striated; the second, third, and basal half of fourth segments are closely stoutly striated; the central keel on the second extends to the apex, it becoming gradually narrowed until it is more than twice longer than it is wide at the base, where it is smooth, the rest being closely longitudinally striated; the sides of the segment are smooth, shining, triangular; the central area on the outer side bears two irregular longitudinal keels; the inner sides bear a few irregular transverse ones. The first transverse furrow has the central third stoutly crenulated; on either side is a large smooth area, longer than wide, the inner side becoming gradually roundly curved from the base to the apex; there is a somewhat similar but smaller and semicircular area on the sides of the fourth segment. There is a smooth, raised, mitre-shaped space in the centre of the face; the sides are sparsely punctured, the punctures with hairs. The parts bordering the centre of the front are raised. Metanotum covered sparsely with long black hair. Temples nearly as long as the top of the eyes, rounded, not much narrowed behind. ♀.

Body 13, ovipositor 17 mm.

This species is not unlike *I. reticulatus*, Cam., which may

be separated from the present by the first abdominal segment being flat, not angled, it having also only a single narrow keel down the centre; the area on the base of second segment is an equilateral triangle, small, the fourth segment is striated to the apex, and the raised central part of the face forms a large triangle. The central lobe of mesonotum, too, is flatter, especially at the base.

Kuching, Borneo.

OPHIONINÆ.

Zachresta nigromaculata, sp. n.

Yellow, with the following black spots:—the ocelli, a large mark in the centre of occiput gradually obliquely widened below; a broad line on the basal two thirds of mesonotum in the centre, slightly dilated and rounded at the apex; a line on the sides, half in front and half behind the tegulæ, the two united at the scutellum by a transverse line; two semicircular marks on the base of metanotum; a mark below the tegulæ, narrow and square above, gradually roundly widened below, where it is transverse; an oblique mark, rounded at base and apex, on the mesopleuræ at the apex close to the sternum; a broad band on the narrowed base of postpetiole, a broad one on the middle of second segment, a triangular incision on its base, the apex transverse; the base of the others broadly, with a spot on their sides; and a mark on the middle of the third to fifth ventral segments. Antennæ black, the scape yellow below. Legs coloured like the body, a broad mark on the base of the hind coxæ below, the basal joint of the hind trochanters (except a narrow stripe in the middle above), a stripe on the outer side of the femora at the base, their base narrowly, and apex and the tarsi (except the basal half of the metatarsus), black. Wings hyaline, the nervures and stigma black; the areolet minute, with a long pedicle, receiving the recurrent nervure in the apex; the transverse median nervure received clearly beyond the transverse basal; the radius and cubitus in hind wings very faint; the posterior nervures obsolete. ♀.

Length 9, terebra 1 mm.

Sikkim.

Tibiæ sparsely, the tarsi more thickly spinose; the calcaria long, about three fourths of the length of metatarsus. Head and thorax closely, somewhat strongly punctured and covered with white pubescence; the metanotum almost rugosely punctured; the apical slope with a broad depression in the

middle. First abdominal segment nearly as long as the second and third united, the apex distinctly dilated; the following segments are not compressed, distinctly broad compared with those of *Campoplex*.

I refer this species to *Zachresta* because the spurs, although longer than usual, are still distinctly shorter than the metatarsus; in the allied genus *Echthronomus*, Foer., they are described as "very long, scarcely shorter" than it. The only difference between this species and *Campoplex* of much importance lies in the abdomen not being strongly compressed, the latter genus having also the metanotum longer and more or less areolated.

Anomalon Binghami, sp. n.

Black; the face, clypeus, mandibles, malar space, a broad line on the lower third of the inner orbits, tegulæ, and underside of antennal scape lemon-yellow; the abdomen (except the top of the basal two segments) rufo-ferruginous; the four front legs fulvous, tinged with yellow, their coxæ and trochanters yellow; the hinder legs rufous, the coxæ and trochanters black above, the former broadly yellow in the middle below, the apical third of the tibiæ black; the apical joints of the tarsi tinged with yellow. Wings hyaline, tinged with fulvous, highly iridescent; the stigma testaceous, the costa and nervures black. ♂.

Length 22 mm.

Sikkim.

Head covered with white hair; the face strongly punctured, the punctures large, clearly separated; the front stoutly obliquely reticulated; the vertex strongly deeply punctured. Mesonotum strongly closely punctured, the punctures running more or less into each other, the apex stoutly transversely striated. Scutellum roughly reticulated, depressed broadly in the centre. Metanotum much more widely reticulated, slightly broadly depressed in the middle, as are also the metapleuræ. Propleuræ stoutly striated, obliquely above, longitudinally below; the upper part distinctly punctured. Mesopleuræ above longitudinally coarsely reticulated; the apex smooth, bare, below the reticulated part, the rest punctured, the punctures clearly separated, each having a black hair. Flagellum of antennæ rufo-testaceous, the basal half black above.

Allied to *A. tinctipenne*, Cam., from the Khasias. The present species may be known from it by the stoutly reticulated front: in *tinctipenne* it is striated rather than reticulated,

the keels, too, being much finer; the yellow mark on the inner orbits is obliquely narrowed above, not of uniform thickness, and there is a similar mark above it, which is not the case with the present species; the puncturation on the mesonotum is finer and closer and does not run into reticulations and striæ at the base; the transverse cubital nervure is as long as the basal abscissa of the cubitus, while in *tinctipenne* it is shorter than it.

PIMPLINÆ.

Rhyssa varilineata, sp. n.

Black, with the following yellow spots:—underside of scape, face, the orbits broadly (except on top), apex of pronotum (its sides more narrowly), scutellar keels, scutellum (except at apex), median segment (except round the edges), tubercles, an irregular spot below them, a smaller line under hind wings, a line down the centre of first abdominal segment (narrowed in the middle, the apex wider than the base), a broader line on the apical three fourths of the second (its apex rounded and dilated), a continuous line near the apex of the third, an interrupted one on the fourth and fifth, and a narrower obscure one on the sixth. Legs yellow, the four anterior coxæ above, the hinder (except for a broad band above), the greater part of the femora behind and the posterior in front in the middle, the base of the four front tibiæ, the posterior to beyond the middle, and the tarsi, black. Wings hyaline, iridescent, the stigma testaceous, the nervures black; a squarish cloud at the end of the stigma, extending shortly beyond the areolet. ♀.

Length 13, ovipositor 12 mm.

Kuching; September (*John Hewitt*).

Smooth, except the striated mesonotum and the scutellum, which is punctured. Pedicle of areolet as long as the straight basal branch. Clypeus narrowed obliquely, testaceous, its middle dilated, almost toothed.

This is the smallest Malay species known. It is near to *maculipennis*, Smith, which may be separated from it, apart from its much larger size, by the much larger alar cloud, which extends beyond the cubitus, and by the metanotum having three separated yellow spots on the apex, the rest being black.

Rhyssa claripennis, sp. n.

Black; the head (except the centre of front), the vertex

and occiput, the mesonotum (except for two lines, rounded on inner side, in the centre), scutellum (except at apex), postscutellum, the keels, metanotum, the pleuræ (except the propleuræ broadly in the centre), the first abdominal segment broadly in the centre, a narrower stripe down the middle of the second (widest at the apex, not touching the base or apex of the segment), and transverse lines before the apices of the others, the apical two interrupted, and the ventral surface, pale yellow. Legs pale yellow, the fore femora behind, the middle above on the apical two thirds, the posterior entirely above, the base of the tibiæ, and the tarsi black. Wings hyaline, the costa and nervures black, the stigma fulvous; pedicle of areolet shorter than lower branches, the recurrent nervure interstitial. ♀.

Length 18, terebra 21 mm.

Kuching; November (*John Hewitt*).

Face closely but not coarsely punctured, thickly covered with short white pubescence. Basal and apical slopes of mesonotum smooth; the striation strongest in front. Clypeus depressed, yellow tinged with rufous.

May be known from the described Indo-Malay and Indian species by the immaculate wings.

Epirhyssa nigrobalteata, Cam.

The markings on this Bornean species vary somewhat, *e. g.* the yellow mark on the mesonotum may be longer than wide, with a triangular incision on the apex.

Epirhyssa curvimaculata, sp. n.

Black; the face, clypeus, inner orbits to the ocelli, the outer narrowly above, broadly below, prothorax (except for a broad band on the pleuræ), a pyriform spot on the sides of middle lobe of mesonotum, a longer one on the inner side of the lateral lobes of mesonotum, straight on outer side, rounded on inner and produced into a sharp point at the apex, scutellar keels, basal two thirds of scutellum, metanotum (except for a semicircular mark on apical half), an oblong mark below the tegulæ, united to an oblique large mark below it, extending from the base to the apex, the metapleuræ (except at the base, the black basal spot having the part above the keel larger than that below it), broad bands (rounded at the base) on the basal two abdominal segments, the lines on the following three broad and curved backwards in the middle, those on the following two broad, curved and widely interrupted in the middle, and the basal ventral segments, pale

yellow. Legs pale yellow, the inner side of the four hinder coxæ, the lower side of the posterior, base of four hinder trochanters, the four hinder femora broadly above, the hinder two also in the middle below, base of tibiæ and the tarsi, black. Wings hyaline, a large fuscous-violaceous cloud at the apex, commencing shortly beyond the transverse cubital nervure and extending to the end of the radial cellule. ♀.

Length 15, ovipositor 28 mm.

Kuching; September (*John Hewitt*).

Face smooth, finely obscurely striated above; the striæ on apical central part of mesonotum much finer and closer than on the rest. Basal half of scutellum closely punctured, as are also (but more finely) the middle segments of the abdomen.

In the male the meso- and metapleuræ are yellow, without black, as is also the breast, the black on first abdominal segment is transverse at the apex, the bands are broader, and the apical segments are reddish brown; the black on the legs is less extended and the apical cloud in the fore wings is small, not extending to the cubitus.

This species comes near to *E. (Macrogaster) flavopictus*, Sm., described from Singapore by Smith and from Borneo by Tosquinet (*Mém. de la Soc. ent. de Belg.* 1903, p. 258). It is a much larger species (25 mm. according to Tosquinet, 15 lines according to Smith). *Macrogaster*, Brullé, does not belong to the Pimplinæ; *Ctenotoma*, Cam., is probably the same. It is purely African, so far as I know.

Epirhyssa cruciata, sp. n.

Black; the apex of the second and the following abdominal segments reddish brown; the face, clypeus, inner orbits to near the end of the ocelli, the outer (except for a broad stripe in the centre of upper third), a large mark (dilated broadly at the apex below) on propleuræ, two small oval spots on the centre of mesonotum at the base, two larger ones (roundly narrowed on the inner side) at the end of the basal lobe, a square mark on the sides of the scutellum at the base, a longer narrower line on the sides of the apex (leaving a black cruciform mark in the centre), a broad curved band on the metanotum near the apex uniting with the yellow on metapleuræ which occupies almost the whole surface, the tubercles, the mesopleuræ (except round the edges and a large oblique mark, narrowed above, near the centre below), a large triangular mark on the sides of mesosternum, a longish line (dilated at the apex) in the centre of apical three fourths of

first abdominal segment, a mark (roundly narrowed behind) near the apex of the second, a curved line shortly beyond the middle of the third, two oblique lines in the centre of fourth, two more widely separated curved ones on the fifth, and more or less of the ventral surface, yellow. Legs yellow, the four anterior femora broadly dark rufous above, the hinder pair of a darker rufous on the inner and outer side; the four hind tibiæ broadly black at the base above, the apex black all round, and the four hind tarsi black. Wings hyaline, the apex lightly smoky, the costa and nervures black, the stigma rufo-testaceous; the recurrent nervure interstitial. ♂.

Length 18 mm.

Kuching; January (*Hewitt*).

Face closely distinctly punctured and thickly covered with white pubescence, the front and vertex smooth. Underside of antennal scape yellow. Mesonotum striated throughout, but more weakly towards the apex. Base of scutellum strongly, the apex more finely and closely striated. Metanotum closely punctured, the punctures clearly separated; at the end of the central furrow are three or four stout curved striæ.

Epirhyssa lineatiscutis, sp. n.

Length 15 mm. ♂.

Kuching; September (*Hewitt*).

This species is very similar to *E. cruciata*, described above; the two may be separated thus:

| | |
|--|------------------------|
| Mesosternum entirely black; mesopleuræ black with a large curved yellow mark below the tubercles and a smaller, triangular one at the apex below; the mark on first abdominal segment not much longer than it is wide at the apex, narrowed at the base, that on the second triangular, as long as the width at the apex, the lines on the third and fourth wide, not curved, continuous | <i>lineatiscutis</i> . |
| Mesosternum black, except for a triangular lateral spot; mesopleuræ yellow, with an oblique black mark at the base; the mark on first abdominal segment long, narrow, on the second narrow, transverse, the lines on the third and fourth narrow, not continuous .. | <i>cruciata</i> . |

The legs are more largely suffused with rufous than in *cruciata*, the four hind tibiæ much darker coloured, the hind coxæ black, yellow above, the line down the centre of scutellum is narrower than the apical which curves round the apex, the black band on base of metanotum occupies the basal fourth and is of equal width, the curved black apical mark is wider at the apex than it is long, the metapleuræ

black round the base, apex, and lower edge; the four lines on mesonotum are longish, narrow. Basal three segments black, except for the yellow marks, the others brownish red. Except that the black line uniting the eyes with the black on vertex is wider, the head is coloured as in *cruciata*. As in that species, the apex of the wings is narrowly smoky. The yellow transverse lines on the third, fourth, and fifth segments are wide, that on the third dilated in the middle at the base.

Xanthopimpla lissonota, sp. n.

Pale yellow, a triangular mark covering the ocelli, a semi-circular mark, the rounded narrowed end at the apex, on the centre of middle lobe of mesonotum, a mark widened in the middle at the base of scutellum, a minute spot on either side of the base of metanotum in the lateral area, and two spots on the seven basal abdominal segments, those on the first produced into a narrowed line at the base, a mark on the outer and inner side of the trochanters, and a line on the base of the hinder tibiae, black; the basal joint of the hind tarsi and the apical two infuscated. Wings hyaline, the apex slightly smoky, the nervures and stigma black; the areolet small, shortly appendiculated. Flagellum black. ♂.

Length 7 mm.

Kuching; November (*Hewitt*).

Areola wider than long, six-angled, the apical keel almost rounded; the lateral area widened gradually in the middle almost to a point; the sides slightly angled in the middle, from which a keel runs towards the apex. Mesonotum smooth, shining; the furrows short, on basal slope only. Except the third to seventh abdominal segments the body is impunctate; the puncturation on the abdomen becomes gradually weaker. Marks on second abdominal segment small, irregular, on the third irregularly round, on the others wider than long, transverse. Face equally roundly convex, closely punctured, squarish.

Agrees best with Krieger's section G (*cf.* Ber. d. naturf. Gesel. z. Leipzig, 1897-8, p. 92).

Echthrus maculiceps, sp. n.

Black; face (except for a line over the clypeus, dilated at the sides above), clypeus, labrum, base of mandibles, a line round the orbits, broadest on the front, palpi, two oblique marks in the centre of the occiput, base of pronotum, a broad line, narrowed in front, on the sides, an irregular squarish

mark in the centre of the propleuræ below, a longish oval mark on the apex of the middle lobe of mesonotum, tegulæ, scutellum (except at apex), a small spot on the sides near the apex of the yellow part and united to it, scutellar keels, a band on the base of metanotum, the black bordering its apex, 4-lobate, a large trilobate mark on apex, the central lobe projecting backwards, smaller than the others, its base incised in the middle, the sides rounded, a broad large mark, the base roundly dilated, the apex straight, produced posteriorly below, this part being also produced backwards as a broad line to near the apex of the basal third on mesopleuræ, the centre of mesosternum broadly, the mark widened towards the apex and with a black mark in the middle of the apex, a small mark under the hind wings, a large one almost covering the metapleuræ, a broad mark on the apex of the first abdominal segment, its basal half narrowed, rounded and incised at the centre, narrower lines, dilated laterally, on the apices of the second to sixth, the seventh (except for a large trilobate mark), the apical lobe square, larger than the lateral, and the ventral surface (except the first and large marks on the following three segments), pale yellow. Antennæ broadly (sixth to twelfth joints) ringed with white. Legs yellow, the anterior paler, the hinder femora fulvous; a spot on the outer apical side of the four anterior, the posterior below and broadly at the apex all round, a line on the trochanters, on the four anterior femora, the apex of the hind femora narrowly, the base of the hind tibiæ slightly more broadly, the apex of the hind tibiæ more broadly, and the apical joint of the tarsi, black. Wings hyaline, the nervures and stigma black.

Length 19, terebra 5 mm.

Quop, Sarawak; November (*Hewitt*).

Closely punctured, densely covered with short white pubescence; the mesopleuræ at the base closely striated; the depressed apex of middle lobe finely longitudinally striated. Base of metanotum behind the keel closely, somewhat strongly striated, the part between the two keels stoutly closely striated in the middle, the sides closely reticulated, the apex much more strongly striated, the striæ curved; the basal keel curved backwards in the middle, the apical stouter, not curved in the middle. Parapsidal furrows distinct, narrow, deep. The first abdominal segment broadly smooth in the centre of narrowed basal part, this smooth line bifurcating on the widened apex; the punctures on the segment are stronger and more widely separated than on the rest of the abdomen. Areolet as long as it is wide at the base,

the apex slightly narrower than the base, through the cubitus turning slightly upwards from the recurrent nervure. The transverse basal nervure is received considerably in front of transverse median.

TRYPHONINÆ.

Eovaya spinipes, sp. n.

Black, the second, third, and fourth abdominal segments red, the fourth with the apex narrowly black; the antennæ with the thirteenth to twentieth joints white; legs black, the greater part of the fore femora and all the tibiæ reddish; the anterior tarsi testaceous, the four apical joints black above; the basal two joints of the middle tarsi testaceous, the third whitish, the apical black; the basal joint of the posterior tarsi black, testaceous at the base, the second to fourth white, the fifth black. Wings hyaline, the nervures and stigma black; the areolet shortly appendiculated, the basal nervure straight, oblique, the apical rounded, the recurrent nervure received near the apex. ♀.

Length 11 mm.

Simla.

Head and thorax alutaceous, opaque, covered with a pale down; the lower half of the clypeus shining, somewhat strongly, but not closely punctured. Apical half of mesopleuræ smooth and shining above. On the apex of the metanotum are three areæ longer than wide, the central larger than the lateral and all rounded above; leading from the base to the central area are two keels which curve inwardly before the middle, the apical half of the area being wider than the basal. The anterior tibiæ sparsely, the four posterior thickly spinose.

This species may be known from *F. annulitarsis*, Cam., the type of the genus (it is also from Simla) thus:—

Clypeus, lower inner orbits, and a spot on the sides of mesonotum at the base pale yellow; flagellum brownish beneath before the white band; second abdominal segment black, red at the base, the inner keel of spiracular area distinct; the four hind femora testaceous.

annulitarsis.

Clypeus, lower inner orbits, and base of mesonotum entirely black; flagellum black before the white band; second abdominal segment red, the inner keel of spiracular area indistinct; the four hind femora black.

spinipes.

*CRYPTINÆ.**Silsila striolata*, sp. n.

Black, a broad band on the centre of the flagellum, face, clypeus, mandibles, palpi, a narrow line on the upper inner orbits, a line on the upper, a broader one on the lower edge of prothorax, the line on the top, narrowed behind, scutellums, scutellar keels, a large, broad, triangular mark behind the hind wings, the apical slope of metanotum, except in the centre, the mark in the centre continued upwards to near the transverse keel, this part becoming gradually narrowed, from its outer edge at the apex a line of equal width runs along the edge of the pleuræ to near the spiracles and below along the coxæ, a broad curved mark on the lower edge of the mesopleuræ, the base being narrower and continued higher up than the apical, and lines of equal width on the apices of the abdominal segments, pale yellow. Four front legs pale fulvous, paler at the base; the fulvous tint on the hind legs is deeper, the lower and outer side of their coxæ, the apical joint of the trochanters, the apex of the femora narrowly, and the base of the tibiæ still more narrowly, black. Wings hyaline, the nervures and stigma black. ♂.

Length 12 mm.

Bidi, Borneo; July (*Hewitt*).

Face, except on the outer edges, closely, roughly punctured, the clypeus smooth. Front stoutly, obliquely striated below the ocelli, the lower part furrowed down the centre. The yellow projecting part of the pronotum stoutly striated; the upper part of the propleuræ irregularly, finely striated and punctured; the middle stoutly striated. Mesonotum closely, distinctly punctured, finely striated on the edges of the lobes; the scutellum smooth, its basal depression deep with four stout keels; the mesopleuræ stoutly striated, except in the middle at the apex. On the base of the metanotum is a band of stout striæ, closely pressed, but clearly separated; the space between them and the keel is, in the middle, coarsely, closely shagreened, almost punctured; the sides have the punctures clearly separated. Metapleuræ closely, rugosely punctured, the punctures running into reticulations, especially at the base. The first abdominal segment smooth and shining, the others opaque, aciculated.

Mesostenioideus cariniscutis, sp. n.

Black; a line on the inner orbits, a mark, longer than wide, narrowed above, transverse at the apex, in the centre

of the face, two large marks, almost united above, in the centre of the clypeus, the apex of the labrum, an irregular line on the base of the pronotum, tegulæ, tubercles, scutellums, scutellar keels, metanotal spines, and the apices of the abdominal segments, yellow; the four front legs yellow, the femora tinged with fulvous, their tarsi fuscous; the hind coxæ and basal two thirds of the femora fulvous, the trochanters, apex of femora, and almost the apical half of the tibiæ, black; the basal part of the tibiæ testaceous, the tarsi white. Antennæ broadly ringed with white. Wings hyaline, the stigma and nervures black, the areolet square; the transverse median nervure received distinctly behind the transverse basal. ♀.

Length 12, terebra 2 mm.

Sikkim.

Front irregularly transversely striated, the striæ weaker below; a narrow keel down the middle. Face finely, irregularly reticulated, the clypeus with large scattered punctures. Mesonotum closely minutely punctured. Scutellum with large lateral keels to near the apex. Base of metanotum finely, closely, longitudinally striated, the striæ becoming stronger towards the apex; the rest closely, strongly reticulated; spines broad, rounded at apex. Abdomen finely, closely punctured, the postscutellum smooth.

Mesostenus respondens, Cam., *M. brahminus*, Cam., *M. missippus*, Cam., *M. clarinervis*, Cam., *M. reticulatus*, Cam., *M. caligatus*, Cam., *M. saltator*, Cam., *M. versatilis*, Cam., and *M. maculiceps*, Cam., from the Khasias, belong to *Mesostenoides*.

Friona lineatipes, sp. n.

Black; the face (except for a short line in the centre below the antennæ and the clypeal fovea), the clypeus (except for a black triangular mark in the centre of apex), the orbits broadly (except the upper half of the outer), mandibles (except the teeth), palpi, a broad line on the pronotum, scutellums, a large, transverse, triangular mark behind the hind wings, a broad longitudinal mark on the middle of metanotum, commencing shortly behind the keel and uniting at the apex to a broader transverse one across the apex, tubercles, a line at the apex of the pleural furrow, a longish mark, widest below, in the middle of the metapleuræ at the apex, not quite the apical half of the postpetiole, a narrower band on the apex of the second segment, a still narrower one on the apex of the third, slightly dilated at the middle, broadly laterally,

where it is continued on the sides to the base of the segment, a similar, but narrower and more irregular line on the fourth, not dilated in the middle, a narrower one, interrupted in the middle, on the fifth, and the sides and middle of the apical two broadly, yellow. Four front legs pale yellow, the femora tinged with fulvous, the middle tarsi infuscated; hind coxæ black, with a yellow mark above, extending from the base to shortly beyond the middle; the trochanters fulvous, the basal joint black at the base below and entirely above; the femora fulvous, broadly black above, more narrowly below; the tibiæ yellow, tinged with fulvous, the base narrowly, the apex more broadly black; the tarsi white with a narrow black line at the base. Wings hyaline, the stigma and nervures black. Antennæ broadly ringed with white. ♀.

Length 13, terebra 5 mm.

Darjiling, 7000 feet; March (*C. T. Bingham*).

Front with a weak, straight, central, and three oblique keels on either side, the inner oblique one weaker than the outer two, the outer keel originating from the hind ocelli; below, the front is depressed; the keels are weaker in the depression. Mesonotum smooth, the apex of its middle lobe stoutly, metanotum closely, rugosely reticulated; the space between the keels stoutly, longitudinally striated; on the sides the striæ run into reticulations; the basal keel is not very distinct, being confused with the puncturation; there is a slight indication of an areola at the base; the second keel is distinct, broadly roundly curved, dilated laterally. Basal slope of scutellum with large, clearly separated punctures, the top is more closely punctured, the punctures running into each other; it is depressed in the middle at the apex; the apical slope closely, strongly punctured. Metanotum behind the keel closely, strongly transversely striated. Pro- and mesopleuræ stoutly longitudinally striated; the mesopleuræ smooth in the middle behind and more or less reticulated below; the metapleuræ stoutly obliquely striated, except for an almost smooth space at the base. The recurrent nervure is received shortly beyond the middle. Pubescence on thorax not very dense and pale in colour.

This species comes near *F. frontella*, Cam., and the Malay *F. varipes*, Cam.

Cratocryptus annulitarsis, sp. n.

Black; a semicircular mark on the sides of the face touching the eyes, a square mark in its centre, touching the

clypeus, the clypeus, a broad curved line on the inner orbits, commencing shortly above the antennæ and extending above to the end of the eyes, a longish triangular mark (the narrowed end above) on the outer orbits, commencing shortly below the middle and reaching near to the middle of the malar space, a broad mark on the base of the mandibles, palpi, a broad line on the middle of pronotum, a line on the lower edge of propleuræ, tubercles, tegulæ, a line on scutellar keels, scutellum, a broad, large mark, roundly narrowed below, on the sides of metanotum on apical slope, and the apices of the abdominal segments (the lines on the basal three broad, narrower on the others), pale yellow. The seventh to thirteenth joints of antennæ white, except above. Legs red, the hinder darker in tint, the tarsi black, the second and third joints of the posterior white; the four anterior coxæ and trochanters yellow; the hind coxæ (except broadly on the inner side, where they are yellow, as they are also at the apex below), the apex of femora narrowly, and the base and apex of tibiæ slightly more broadly, black. Wings hyaline, the stigma and nervures black. ♀.

Length 10, terebra 2 mm.

Sikkim.

Face rugosely punctured, more or less reticulated in the centre; the clypeus strongly, sparsely punctured. Front in the centre, to the apical depression, strongly striated, the striæ intermixing; it is longitudinally striated above, transverse below. Mesonotum closely, finely punctured, irregularly transversely striated along the furrows. Scutellar depression wide and deep; there are four stout keels on it. Metanotum behind the keel stoutly, longitudinally striated; the rest stoutly, closely reticulated. Pleuræ closely, rugosely reticulated; the greater part of the propleuræ stoutly striated. The first and the apical segments of the abdomen smooth; the middle closely punctured. Areolet wider along the radius than along the transverse cubital nervures, of almost equal width; the recurrent nervure is received shortly beyond the middle.

This species has the general coloration (including the marks on the face) of *C. rufipes*, Cam., from Deesa, but is much larger; they may be separated as follows:—

- | | |
|---|-----------------------|
| Base of metanotum punctured, with an areola; the post-petiole strongly punctured; meso- and metapleuræ with yellow marks; hind coxæ red; the hind tarsi not maculate with white | <i>rufipes</i> . |
| Base of metanotum striated, without an areola; the post-petiole smooth; meso- and metapleuræ immaculate; the hind coxæ black and yellow, the hind tarsi maculate with white | <i>annulitarsis</i> . |

Colganta latiscutis, sp. n.

Rufo-fulvous; the basal six joints of antennæ coloured like the body, the seventh to twelfth pale yellow, the apical black; the apical joint of the middle tarsi, the apical two of the hinder as well as the base of the second and third joints of the hind pair black. Wings hyaline, highly iridescent, suffused with brassy tints; the costa and stigma dark testaceous, the nervures black. Median segment closely rugosely punctured-striated-reticulated; the two basal keels are irregular; the basal abscissa weaker than the apical, its basal part straight, the apical longer, weaker, and roundly curved outwardly. Eye-orbits broadly pale yellow; the front in the middle closely rugosely punctured, raised, obliquely narrowed to a point below. Temples almost obsolete, the eyes above extending to the extreme edge, below they are abruptly obliquely narrowed; the margined edge of occiput is placed low down below the top of the eyes. Pro- and mesopleuræ closely distinctly punctured. Scutellum closely strongly punctured, thickly covered with longish black hair; the lateral keels extend to the middle. Mandibles pale yellow, the apex from shortly behind the teeth black. Centre of face slightly raised, of equal thickness, not tuberculate above. Scutellum broad, rounded at the apex, which has a longish, steep, vertical slope.

Length 17, terebra 3 mm.

Sikkim.

May be known from *C. fulvipennis*, Cam., by the middle of the antennæ being clear yellow, the antennæ being distinctly three-coloured, by the temples being much less developed above and more sharply oblique, by the shorter ovipositor, and by the difference in the metanotal keels: in *fulvipennis* the inner keel is straight, the apical slightly rounded backwards in the middle and obliquely sloped; there is a distinct outer keel inside the spiracles, it having the basal two thirds roundly curved inwardly, the lower third straight; in the present species there is no outer keel and the inner is broadly roundly curved. The difference in the form of the scutellum is well marked; in *fulvipennis* it is clearly longer than wide and becomes distinctly narrowed towards the apex, with a gradual, short, not a vertical slope.

APHADNUS, gen. nov.

Areolet entirely open at apex, the only transverse cubitus

short, the recurrent nervure widely distant from it, the cubitus between it and the transverse cubitus sharply obliquely sloped. Antennæ 30-jointed, basal three joints of flagellum greatly elongated, the basal two of equal length. Transverse median nervure in hind wings broken below the middle. Hind ocelli separated from the eyes by a greater distance than they are from each other. Eyes very large, the temples very short, the occiput roundly deeply incised. Metanotum with three central areæ, the petiolar a longish triangle, the areola longish, 6-angled, obliquely narrowed at the base, the apex transverse; the apical area occupying the apical slope; there are two large lateral basal areæ; spiracles small, not much longer than wide, broadly rounded before and behind. First abdominal segment large, longer than it is wide at the base; the first, second, third, and base of fourth segments closely, regularly, longitudinally striated.

The antennæ are as long as the body, slender, ringed with white; the wings are spotted. Parapsidal furrows distinct, complete, the metathorax densely covered with long pubescence. Radial cellule wide near the middle; radius issuing from middle of stigma, its first abscissa shorter than second. Eyes higher than the vertex.

This genus cannot be confounded with any of the known genera of Hemitellinæ wanting the areolet. The first abdominal segment is shorter and wider than usual; noteworthy are the striated basal abdominal segments.

Aphadnus rufipes, sp. n.

Black; tegulæ, a broad band on the apex of the first abdominal segment, a stripe in the centre of the apex of the second, apical half of fourth, an obscure broken narrow line on fifth, and a narrow complete one on sixth, whitish yellow. Legs bright red, the four anterior coxæ, the base of hind tibiæ behind, and the hind spurs white; the rest of the hind tibiæ and the tarsi black. Wings hyaline, a cloud (rounded and narrowed in front) before the apex of transverse basal and transverse median nervure, extending slightly beyond the latter, a large one extending from the base to near the apex of radial cellule, its lower half projecting backwards along the discocubital nervure, and one in the apical fourth of hind wings, almost black; the nervures and stigma black. Head opaque, closely punctured, densely covered with white pubescence, as are also the pleuræ and metanotum. Face and clypeus dilated in the centre. Middle lobe of mesonotum somewhat

strongly and closely striated, the outer and inner edges of the lateral more finely striated, their centre opaque, alutaceous. Base of metanotum irregularly transversely striated, more finely and closely on the inner side at the base, the apical striæ interlacing, the apical slope more strongly, obliquely, and transversely striated, the striæ more or less interlacing. Except on the smooth apex the basal segment of abdomen is closely finely striated, as is also the basal half of the fourth; the striation on the second and third is stronger. Abdomen as wide as the thorax and slightly longer than the head and thorax united. ♀.

Length 7, terebra 2 mm.

Kuching; September (*J. Hewitt*).

ICHNEUMONINÆ.

Imeria levifrons, sp. n.

Black; the entire head smooth, shining; the mesonotum opaque, closely irregularly striated; the propleuræ almost smooth; the mesopleuræ smooth at the apex above, the rest closely longitudinally striated, the striæ more or less twisted; the metapleuræ smooth at the base and below, the rest more or less striated; the metanotum (except the enclosed space at the base) closely reticulated, more or less striated; the abdomen less shining than the thorax. The following are pale yellow: face, clypeus, mandibles, palpi, a spot outside the lower part of the eyes, the upper inner orbits somewhat broadly from the antennæ to the ocelli; a large broad oblique mark, obliquely narrowed on the outer side, behind the top of the eyes; a small irregular mark outside the lower edge of the eyes. Base of pronotum, a line on the apical half of the sides above, tubercles, scutellum, apical slope of metanotum, the mark roundly dilated above in the middle, a large elongated triangular mark below the hind wings, a line about the same length on the lower apical half of the apex of metapleuræ, its base roundly narrowed, the apex of the first abdominal segment broadly, a mark on the apex of the second and base of third, forming united a triangular lateral mark, narrow lines on the apices of the third to sixth all round, and the seventh broadly, whitish yellow. Four front legs whitish yellow, the femora tinged with fulvous, the hinder yellow, the femora and tibiæ broadly black, the tarsi fuscous; the coxæ black, rufous at the base. Wings hyaline, the nervures and stigma black. ♀.

Length 7 mm.

Kuching; September (*John Hewitt*).

Antennæ longer than the body, the fourth to eighteenth joints of the flagellum white. Ovipositor-sheath largely projecting, as long as the apical two joints united. Apex of scutellum slightly rounded inwardly, the lateral keels of equal height. Areolet 5-angled, the nervures clearly separated in front. Apex of abdomen becoming gradually narrowed from the middle. Transverse keels on metanotum indistinct.

Imeria, Cam., was described from the Khasia Hills, Assam, in *Ann. & Mag. Nat. Hist.* xi. (7) 1903, p. 174. Its occurrence in Borneo is another proof that Assam belongs to the Indo-Malay zoological region rather than to the Indian. It has a considerable resemblance in the form of the head and abdomen to *Aulajoppa*, Cam., but that genus has longitudinal as well as transverse keels on the metanotum. *Imeria* has only transverse keels.

ALLONOTUS, gen. nov.

Antennæ ringed with white, broadly dilated as in the Joppini. Clypeus clearly separated, raised in the middle above, the sides above bordered by a furrow. Mesonotum with distinct parapsidal furrows on the basal half, the basal half of the mesosternum bordered by a distinct, if narrow, furrow. Scutellum keeled laterally to the top of the apex, which has a longish oblique slope. Metanotum regularly areolated; the areola widely distant from the base, longish triangular, the narrowed end at the base; there is no petiolar area, the basal lateral area therefore being confluent; there are three areae on the apical slope, the lateral keels of which are dilated near the top. Abdominal petiole dilated at the apex, the postpetiole not, however, separated; there are seven segments of equal width (except that the second is narrowed at the base); the ovipositor has a longish sheath, which projects obliquely over the top of the last segment, which is bluntly pointed; gastrocœli broad, smooth, broader than the space separating them. Legs stout, the hind coxæ large, the tarsi spinose. Areolet 5-angled, narrowed in front; the discocubital nervure with an indication of a stump; the transverse median nervure interstitial. Head large, the temples broad, rounded; the occiput deeply incised.

The thorax is long, about three times longer than wide; the eyes are large, parallel; there is a short malar space; the transverse median nervure in the hind wings broken near

the bottom. The ventral keel extends to the apex of the fourth segment. Head large, wider than the thorax. Labrum hidden.

The edentate mandibles refer this genus to the Heresiarchini. It cannot well be confounded with any of the known genera in that group. The parapsidal furrows and that on the mesonotum are quite as distinct as they are in many Cryptinæ; but in other respects the genus belongs to the Ichneumoninæ. The antennæ are exactly as in the Joppini. Characteristic is the dilated at the base, clearly separated clypeus. In this respect the clypeus shows an approach to what it is in *Chiaglas*, an East-Indian genus belonging to the same group, but differing considerably otherwise.

Allonotus rufus, sp. n.

Rufous; the red on the second and following segments of the abdomen darker, more testaceous in colour; a broad band at the outer sides of the ocelli (continued as a narrower line in front of them), the second abdominal segment (except at the sides and apex), slightly more than the basal half of the third and fourth segments, the fifth (except narrowly at the apex), the sixth (except for a narrow white line at the apex), and the seventh (except for a wide white band in the middle), black; the petiole has the bright red colour of the thorax; the gastrocœli pale rufous. Legs coloured like the thorax, except the apices of the four anterior tarsi broadly, the apex of the hind femora narrowly, and the hind tibiæ and tarsi, which are black. Antennæ with the scape rufous, the flagellum black, brownish at the base below, the middle with a broad white band. Wings hyaline, the stigma fuscous, the nervures black. ♀.

Length 10 mm.

Kuching; December (*Hewitt*).

Face and clypeus smooth, the former pilose, the latter bare; the rest of the head smooth and shining. Except the mesonotum (which is opaque and slightly shagreened), the thorax is smooth and shining, as is likewise the abdomen (except the second and third segments, which are slightly shagreened). The thorax is three times longer than wide; the scutellum is not raised above the mesonotum and is longer than wide; the metathorax is densely covered with a short pile.

[To be continued.]

III.—On Three new Mammals from South Africa.

By R. C. WROUGHTON.

IN a small collection of mammals recently presented to the Natural History Museum by Mr. C. W. Turner, of Good Hope, near Aberfeldy, in the north-east of the Orange River Colony, there are three specimens of an *Otomys* which differs from any form hitherto described.

Otomys Turneri, sp. n.

An *Otomys* of the general form of *O. Sloggetti*, but slightly larger and paler.

Fur long and soft; 17–20 mm., against 10–12 mm. in *O. Sloggetti*.

General colour above between “raw umber” and tawny olive; the individual hairs “slate-grey,” with a “clay-coloured” tip (5 mm.), but a certain small proportion of them, of greater length, with black tips (5–10 mm.).

Under surface “pinkish buff”; the hairs with slaty bases. Hands and feet silvery white; hairs on tail, like those on back, markedly longer than in *O. Sloggetti*; in the latter the hairs of its upper surface are coloured black, whereas in *O. Turneri* all are dull white except a few on the median line, above, towards the end.

Skull and dentition in all essential characters the same as in *O. Sloggetti*, but upper molar row distinctly larger and nasals more spatulate (6.5 mm. at broadest, instead of 5 mm. in *O. Sloggetti*).

Dimensions of type specimen:—

Head and body 134 mm.; tail 49; hind foot 24; ear 17.

Skull: greatest length 35; basilar length 29; zygomatic breadth 19; length of upper molar series 8.5; bullæ 7.5.

Hab. Aberfeldy, N.E. Orange River Colony. Alt. 3500'.

Type. Young male. B.M. no. 7. 5. 25. 5. Original number 27. Collected on 9th July, 1906.

Only one of the three specimens sent has a skull, and unfortunately it is the youngest. Though young, however, the type is adult, and the skull-dimensions given above may be accepted as practically normal for the species, but the body-measurements are small. The largest of the three specimens measured head and body 160 mm. and tail 59; this was almost certainly a fully-grown animal.

This new species is undoubtedly very close to *O. Sloggetti*, from which, however, it is separable externally by its longer

fur, paler general colour, white feet and longer hind feet, and by the skull having broadened spatulate nasals and a longer upper molar tooth-row.

In my key to this genus (published in this Magazine in October last, p. 266) the last section under *A. a*¹ might now stand as follows :—

*b*³. All four laminae of *m*₁ complete ; tail short and slender.

*a*⁴. Fur long ; hind foot 24 mm. ; upper molar series 8·5 mm. (O.R.C.)..... *O. Turneri*, sp. n.

*b*⁴. Fur short ; hind foot 22 mm. ; upper molar series 7·5 mm. (Deelfontein.) *O. Sloggetti*, Thos.

In order to compare a specimen of *Pedetes* contained in Mr. Turner's collection, I had occasion to lay out all the specimens available in the Museum, with the result that it became at once apparent that there are at least three local races of the South-African *Pedetes cafer* separable on colour-characters. They are distinguishable as follows :—

A. Tail dark above; paler below than above, but not white ; ears (*circ.*) 75 mm. (Cape Colony.) *P. cafer*.

B. Tail pale above, white below.

a. General colour above "wood-brown" ; ears longer, (*circ.*) 75 mm. (O.R. Colony.) *P. c. orangeæ*.

b. General colour above redder, nearest to "vinaceous cinnamon," but darker ; ears shorter, (*circ.*) 70 mm. (N. Transvaal.) *P. c. salineæ*.

The following are descriptions of the new subspecies :—

Pedetes cafer orangeæ, subsp. n.

Size and general characters as in true *P. cafer*.

General colour above "wood-brown." Hairs on the shoulders and back pale slate-coloured at their bases, then "pinkish buff" with black tips ; a small proportion of wholly black hairs sparsely scattered among the others. (In all three forms the slaty bases, black tips, and scattered black hairs disappear on the lower back, rump, and tail.) Colour below pure white, the hairs white to their bases. Tail above coloured like the rump, below pure white (except a discoloured area near the base) ; tip for about 100 mm. black above and below.

Skull-characters as in true *P. cafer*.

Dimensions of type :—

Head and body 400 mm. ; tail 410 ; hind foot 130 ; ear 75.

Skull : upper length 89 ; basilar length 62 ; zygomatic breadth 57.

Type. Adult female. B.M. no. 7. 5. 25. 11. Original number 24. Collected by Mr. C. W. Turner on 27th February, 1906.

Hab. Aberfeldy Dist., O.R.C.

Other specimens from Ladybrand and Vredefort show that this form extends all over the Orange River Colony, and even to Bechuanaland.

Pedetes cafer salinæ, subsp. n.

Size and general characters as in true *P. cafer*.

General colour above as in *P. cafer*, though slightly paler, much redder than in *P. c. orangeæ*; the ground-colour of the hairs "vinaceous cinnamon" rather than "pinkish buff," and the proportion of black greater. The underside quite as in *P. c. orangeæ*.

Skull-characters as in true *P. cafer*.

Dimensions of type:—

Head and body 398 mm.; tail 464; hind foot 144; ear 70.

Skull: upper length 90; basilar length 63; zygomatic breadth 57.

Type. Adult female. B.M. no. 6. 4. 3. 86. Original number 1345. Collected by Mr. C. H. B. Grant on 30th December, 1905, and presented to the Museum by Mr. C. D. Rudd.

Hab. Woodbush, Zoutpansberg Dist., N.W. Transvaal.

Two other specimens taken at the same time and place do not materially differ from the type.

IV.—*Descriptions of new Species of African Spiders and Solifugæ.* By A. S. HIRST.

Pterinochilus Hindei, sp. n.

♂.—*Cephalothorax* equal in length to patella, tibia, and tarsus of maxillipalp and considerably shorter than patella and tibia of fourth leg. Ocular tubercle considerably longer than broad, the clypeus narrow.

Legs. 4, 1, 2, 3. Metatarsus of first leg sinuate, with the distal end slightly thickened, and leaving but little space between metatarsus and spur of tibia when closed on tibia; tibia of first leg more slender than femur. Patella and tibia

of first leg longer than the corresponding segments of the fourth.

Palpal organ resembling closely that of *P. murinus*, the terminal portion of the style very long and slender (fig. 1).

Fig. 1.



Palpal organ of *Pterinochilus Hindei*.

Measurements in mm. Length of cephalothorax 13·5, of patella, tibia, and tarsus of palp 14·75, of first leg 49, of second leg 44·5, of third leg 41, of fourth leg 50, of patella and tibia of first leg 16·5, of patella and tibia of fourth leg 15·25; total length 27.

Hab. A single male specimen was collected by Mr. S. L. Hinde at Fort Hall (4400 feet), British East Africa.

Remarks. The male of *P. Hindei* differs from that of *P. murinus*, to which it is closely allied, in the much smaller size and in that the cephalothorax equals the patella, tibia, and tarsus of the maxillipalp, whilst in *murinus* the cephalothorax considerably exceeds the patella, tibia, and tarsus of the palp in length.

Pterinochilus murinus, Pocock.

Pterinochilus murinus, Pocock, Proc. Zool. Soc. 1897, p. 753, pl. xliii. fig. 4; 1898, p. 501.

♂.—*Cephalothorax* longer than patella, tibia, and tarsus of maxillipalp, and shorter than patella and tibia of fourth leg.

Legs. Metatarsus of first leg sinuate and dilated distally, tibia of first leg more slender than femur. Patella and tibia of first leg exceeding patella and tibia of fourth in length.

Size. This species is much larger than *P. Hindei*.

Measurements in mm. Length of cephalothorax 19, of patella, tibia, and tarsus of palp 17·25, of patella and tibia of first leg 23, of patella and tibia of fourth leg 20; total length 32.

Hab. Mombasa (*Capt. Crawshay*).

Pterinochilus meridionalis, sp. n.

♂.—*Colour.* Cephalothorax greyish black, with lines of yellowish hairs radiating from the fovea; sternum and ventral surface of coxæ of legs deep black; abdomen greyish yellow, the ventral surface marked with a dark patch.

Cephalothorax almost equal in length to patella and tibia of fourth leg, much shorter than patella and tibia of first leg, and considerably exceeding patella, tibia, and tarsus of maxillipalp in length. Ocular tubercle longer than wide, clypeus of moderate length.

Legs. Metatarsus of first leg moderately stout, curved, thickened apically, of much less length than tibia, and leaving but little space between spur and base of metatarsus when closed on tibia.

Palpal organ with the style fairly long and slender (fig. 2).

Fig. 2.



Palpal organ of *Pterinochilus meridionalis*.

Measurements in mm. Length of cephalothorax 14, of patella, tibia, and tarsus of palp 11·75, of tibia of first leg 11, of metatarsus of first leg 9·5, of patella and tibia of first leg 17, of patella and tibia of fourth leg 14·5; total length 25.

Hab. A single male specimen was collected at Dowa, British Central Africa, by Mr. A. R. Andrew during March 1907.

Heteroscodra crassipes, sp. n.

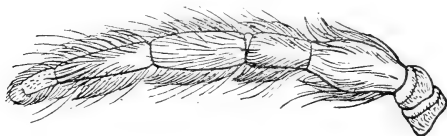
♀.—*Colour*. Legs marked with dark spots, which are distributed much as in *H. maculata*.

Cephalothorax longer than wide, of much less length than patella and tibia of fourth leg, and exceeding patella and tibia of first leg in length.

Sternum a little longer than broad; posterior sigilla situated in the posterior third of the sternum and at but little distance from the lateral margins.

Legs. Tibia and patella of first leg much shorter than the corresponding segments of the fourth. Fourth leg long-haired and very stout, the femur being much swollen and the patella and tibia of considerable thickness. Metatarsus of fourth leg a little longer than tibia (fig. 3).

Fig. 3.

Fourth leg of *Heteroscodra crassipes* from above.

Measurements in mm. Length of cephalothorax 21, of first leg 60, of second leg 57, of third leg 57, of fourth leg 77, of patella and tibia of first leg 20, of patella and tibia of fourth leg 25; total length of body 50; width of cephalothorax 18·25, of femur of fourth leg 7·75, of tibia of fourth leg 5·5.

Hab. An adult female from Efulen, Camaroons, and another from the forest 25 miles inland to the east of Kribi, Camaroons. These specimens were collected by Mr. G. L. Bates.

Remarks. This spider differs from *H. maculata*, the only other species of the genus, in the much greater thickness of the fourth pair of legs and in the great dilatation of their femora.

Cladomelea ornata, sp. n.

♀.—*Colour* pale yellow; tarsi and distal portions of metatarsi of legs fuscous, the metatarsi of the legs of the anterior pairs being marked in the middle of their length with an additional dark patch; patellæ and tibiæ of legs

with light brown spots; cephalothoracic spines apically darkened.

Cephalothorax. Ocular tubercle moderately elevated as compared with that of *C. longipes*, the three spines of the cephalothorax of fair length and the middle one slightly curved in an anterior direction (fig. 4).

Fig. 4.



Side view of cephalothorax of *Chasmodon ornata*.

Abdomen. Dorsal tubercles of abdomen small, almost uniform in size, and distributed much as in *C. longipes*. The two median tubercles of the second row are replaced, however, by a single tubercle. Additional tubercles are present in the posterior median part of the abdomen, a couple being situated between the row of three tubercles and the lozenge-shaped group of four tubercles and another pair placed posteriorly to the lozenge-shaped group.

Legs. Patella and tibia of first leg a little longer than metatarsus and tarsus, and with tibia, metatarsus, and tarsus more slender than is the case in *C. longipes*.

Measurements in mm. Length of first leg 27, of second leg 19.5, of third leg 10, of fourth leg 13.5, of posterior cephalothoracic spine 2.75, of ocular tubercle .5, of cephalothorax 4.75, of abdomen 10; total length 14.5; breadth of cephalothorax 4.75, of abdomen 12.

Egg-cocoon pale yellow in colour, hemispherical, the surface smooth, the pedicle very short.

Hab. Dry foot-hills, South-east Ruwenzori, altitude 3400 feet; a single female specimen was collected by the British Expedition to Ruwenzori in May 1906.

Remarks. The more important differences between this new form and *C. longipes* are shown below. The characters of the latter species are in part taken from a female specimen from San Salvador, Congo.

Ocular tubercle moderately elevated, the three spines of the cephalothorax fairly long; tubercles of dorsal surface subequal in size; patella

- and tibia of first leg together a little longer than the metatarsus and tarsus *C. ornata*, sp. n.
 Ocular tubercle high, the three spines of the cephalo-
 thorax long; abdomen dorsally with a pair of
 antero-lateral enlarged tubercles; patella and
 tibia of first leg together a little shorter than
 the metatarsus and tarsus. *C. longipes*, Cambr.

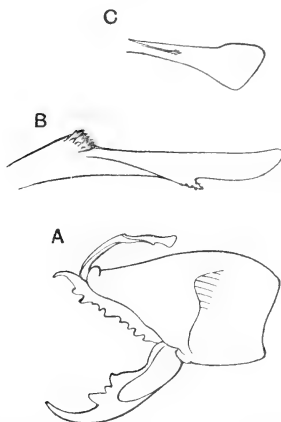
Solpuga Fordi, sp. n.

♂.—*Colour* pale yellow; mandible and head-plate pale brown above, abdomen dorsally pale or darkened.

Head-plate exceeding tibia or metatarsus and tarsus of maxillipalp by nearly two thirds of its breadth.

Mandible with the end curved. Anterior teeth two in number and separated from the succeeding large tooth by two intermediate ones, the first of these being exceedingly

Fig. 5.



- A. Mandible of *Solpuga Fordi* from the inner side.
 B. Distal half of flagellum of *S. Fordi* from above.
 C. Side view of terminal portion of flagellum of *S. Fordi*.

minute. Flagellum dorsally provided with a spined projection on angle, situated at the junction of the dark-coloured anterior part with the distal and paler part. Inner side of flagellum furnished with a smooth ridge (sometimes with a few spines towards the distal end) running from the angular point and

terminating towards the distal end of the flagellum in a spined projection. Distal part of flagellum dilated and squarely truncate. Flagellum inserted above the interval between the two anterior teeth and extending posteriorly to the middle of the mandible; basal lamina moderately elevated (fig. 5).

Maxillipalp. Tibia, metatarsus, and tarsus of maxillipalp ventrally provided with numerous cylinder-bristles, those of the metatarsus and tarsus unequal in size and more numerous than those of the tibia.

Measurements in mm. Length of tibia of maxillipalp 13.75, of metatarsus and tarsus of maxillipalp 12; breadth of cephalothorax 8. (In another specimen tibia 12, metatarsus and tarsus 11, cephalothorax 6.5.)

Hab. Two males of this new form were collected by Captain R. Ford in British East Africa (near Lake Baringo?).

Remarks. The specimens are dry and somewhat shrunken, and therefore the total length cannot be given. The colour also is somewhat faded. The species may be readily distinguished by the peculiar form of the flagellum.

V.—Remarks on Prof. L. von Méhely's Paper “Zur Lösung der ‘Muralis-Frage.’” By G. A. BOULENGER, F.R.S.

PURSuing his studies towards the solution of the *Lacerta muralis* problem, studies which, it is already perfectly clear, will result in a plethora of ill-defined Jordanian species, the distinguished Hungarian zoologist Prof. von Méhely has recently published a short paper* in which he attempts to prove that the derivation of forms must have taken place in a direction the reverse of that postulated by Eimer† and since endorsed by most workers at this difficult group, including myself, and to which Dr. Gadow's recent investigation of the American lizards of the genus *Cnemidophorus*‡ has given further support.

The numerous variations in the pattern of markings in *L. muralis* fall roughly under five heads—*striated*, *spotted*, *reticulated*, *barred*, *ocellated*. It is evident to any one studying large series that these different types of markings are insensibly connected by every possible gradation§. The

* Ann. Mus. Hung. v. 1907, p. 84, pl. iii.

† Arch. f. Naturg. 1881, p. 375.

‡ Proc. Zool. Soc. 1906, i. p. 277.

§ Eimer has pointed out that the pattern on the posterior part of the body anticipates the evolution of that on the anterior part. This is true

question is merely to determine which is to be regarded as the most primitive. Ontogeny, in these lizards as well as in their American analogues the *Cnemidophori*, indicates the direction, as it is the general rule for new types of markings to be produced in adult males and to be then transmitted to females and young *, and strong evidence, derived from other features, would be needed to convince us that, as now held by Méhely, "striation is not the phyletic initial form, as believed by Eimer, but the phyletic terminal stage." His opinion rests, in the first place, on the assumption † that *L. saxicola* and *L. chalybdea* represent the most primitive forms of wall-lizards, and he now attempts to strengthen his position by arguments which seem to me based on a misconception of the evolution of cranial characters.

In my contribution published in 1905 ‡ I expressed my full agreement with Eimer in regarding the striated type of the var. *campestris* as the most primitive among all the wall-lizards, and I added that "we are led to regard the var. *campestris* as the most ancient form from which the others were derived; and this, I think, is also supported by the structural characters, which differ less from what we may assume to be the more normal or generalized form of *Lacerta* before adaptation to climbing petrophilous habits had been reached." A form with massive convex skull, like the var. *campestris*, would lead through a number of almost insensible gradations, such as actually exist, to the much flattened skull which has been distinguished by Eimer as the platycephalous type in opposition to the pyramidocephalous. I have never been able to draw a satisfactory distinction between the two types, and I do not quite understand how Prof. v. Méhely manages to group his "species" according to this character. In the list he gives I notice that *L. tiliguerta* is regarded by him as pyramidocephalous. In the paper of mine § to which he refers I have described the head of the true "Tiliguerta" from Sardinia as "rather strongly depressed, the occiput quite flat or even slightly concave"; it is certainly as a rule more

of the markings on the tail. In primitive striated forms, such as *L. agilis*, *L. taurica*, *L. campestris*, the tail is frequently more or less striated or "maculato-striata," whilst in extreme reticulated forms, such as *L. oxycephala*, *L. sardoa*, *L. nigriventris*, it is more or less distinctly barred. Reproduced tails, if bearing any markings, are always longitudinally striped.

* This is clearly shown in the vars. *campestris* and *serpa*. We cannot imagine the reverse.

† Ann. Mus. Hung. ii. 1904, p. 376.

‡ Trans. Zool. Soc. xvii. 1905, p. 388.

§ *L. c.* p. 409, pl. xxviii. fig. 7.

platycephalous than that of the typical *L. muralis*, which falls in the platycephalous group of Méhely. Besides, the works of Eimer and of Bedriaga show, in several instances, that these authors have been unable to correctly appreciate the character to which, in my opinion, they have attached too great importance*.

Yet, when we compare extreme forms, such as var. *campestris* or *fumana*, on the one hand, and var. *Bedriagæ*† or *sardoa* on the other, the difference in the two types of heads stands out very strikingly. We are not much the wiser when the skulls have been prepared, as the characters pointed out by Prof. v. Méhely are, for the most part, correlative of the degree of elongation or depression of the head, which can be appreciated without injuring the specimens. It must be borne in mind that skulls of lizards cannot be extracted as we do in the case of mammals. Preparing the skull means the partial destruction of the specimen, and in a discussion of this kind, dealing mainly with individual variations, annectant examples cannot always be sacrificed. Prof. v. Méhely has given us figures of two extreme types of skulls, but I could easily lay out a series that would to such an extent bridge over the differences as to show of how little practical value they are for the definition of species. A discovery of Prof. v. Méhely's is the incomplete ossification of the supraocular region in the most pronounced platycephalous wall-lizards. But even here he is obliged to make this restriction—that in some, in the var. *Bedriagæ*, for instance, the fontanelle in the supraocular bony plates is "nicht immer vorhanden" in adult males. The character is therefore not of so great importance after all.

What surprises me most is to find that Prof. v. Méhely is not at all aware of the individual variations which occur in the skulls of the forms which he classifies as "rein platycephal" and "rein pyramidocephal." Thus he attaches a

* For instance, in the vars. *nigriventris*, *serpa*, and *quadrilineata*, some specimens have been referred by Bedriaga to the pyramidocephalous group (*L. muralis neapolitana*, Bedr.) and others of the same race to the platycephalous (*L. muralis fusca*, Bedr.). Eimer regards the Maltese lizard as platycephalous and its Filfolia derivative as pyramidocephalous, a distinction which is not borne out by the material at my disposal. Werner has also fallen into the same pit, in describing examples of the same form (*L. muralis littoralis*, Werner) under the two groups (vars. *lissana* and *fumana*). I myself do not blush at confessing similar errors, due, perhaps, more to the nature of things than to any want of "Scharfblick" on my part.

† Prof. v. Méhely calls this lizard *L. reticulata*, Bedr. But this name is otherwise employed in the genus *Lacerta* (*L. muralis reticulata*, Schreiber, Eimer).

great importance to the size and position of the true supra-orbital bone, and yet a skull of an adult male of the var. *Bedriagæ* which I have prepared for the purpose of verifying his statements has the supraorbital bone entirely concealed under the first osteodermal supraocular and the first supra-ciliary, and this bone is rather smaller than in a male of the var. *tiliguerta* from Cagliari. It is clear to me that Prof. v. Mèhely is not familiar with the skull of the true *L. tiliguerta*, which, as stated above, he regards as pyramidocephalous. The sketch here given of the bony plates of the supraocular region, carefully prepared for me by Mr. E. Degen from an adult male from Cagliari, shows that the ossification of that region may in individual cases be incomplete; and I should add that the nasal apertures may be nearly as large as in *L. Bedriagæ*, also that ossifications are altogether absent from the temporal region. I have already pointed out*, and still believe, that the var. *tiliguerta* constitutes in a certain sense a link between the var. *Brueggemanni* on the one hand, and the vars. *Bedriagæ* and *sardoa* on the other.



Supraocular region
of *L. tiliguerta*.

Mr. Degen has also found the supraocular region incompletely ossified in male specimens of the vars. *Lilfordi* and *fiumana*.

Prof. v. Mèhely thinks a study of the cranial characters affords a key to the solution of the *L. muralis* problem from the point of view of the phylogeny. He starts from the assumption that the more feeble development of the osteodermal plates of the head indicates a lower stage of evolution, and as the ultra-platycephalous forms of wall-lizards belong more to the reticulate type of pattern, whilst the striated lizards (with six light streaks) are pyramidocephalous, he declares "so ist es klar, dass die Längsstreifung nicht die phyletische Ausgangsform kennzeichnet, wie Eimer annahm, sondern gerade die phyletische Endstufe anzeigt."

I wish to give here my reasons for differing from this view. In most groups of lower vertebrates, in which we have some indication of orthogenetic derivation of forms, we find that a massive skull degenerates into a more feebly ossified one so far as the "roof" is concerned. Among Silurid fishes we have a beautiful example in the series *Clarias*—*Allabenchelys*

* *L. c.* p. 404.

—*Clariallabes*—*Gymnallabes*—*Channallabes*, in which we witness the gradual disappearance of the plates which roof over the sides of the skull, concurrently with the eel-like elongation of the body, the reduction of the caudal fin, and the reduction and ultimate suppression of the paired fins—a most suggestive series, the direction of which is unmistakable. Again, in the Characinid fishes, as pointed out by Sagemehl, the more primitive types, with large toothed maxillary bone, have a massive skull, the fontanelles appearing together with the reduction of the maxillary bone. The same story is told, in a somewhat different way, by Chelonians (*Chelydra*—*Staurotypus*, *Emys*—*Cistudo*, &c.). In Lizards, also, when we have to deal with an unmistakable orthogenetic series, the drift of which is open to no question, as in *Chalcides*, for instance, the more generalized type has a more convex skull, better protected by osteodermal plates. But there is another point which is of great importance, and which Prof. v. Méhely does not appear to have considered. The *Lacertæ* with massive skulls, from which I would assume the platycephalous lizards to have been derived, have teeth on the palate (pterygoid bones). These teeth are nearly constantly present in *Lacerta taurica* and constantly absent in the forms of *L. muralis* with supraocular fontanelles mentioned by Prof. v. Méhely. Now, the only cases in which I have found teeth on the palate in *L. muralis* have been in examples of the pyramidocephalous vars. *campestris* and *serpa**, a fact which, in my opinion, goes a long way to support the view of Eimer as to the general drift of evolution in this group of lizards.

Much as I value the careful investigation of neglected points of structure, whether external or osteological, to which Prof. Méhely is devoting himself, I cannot help regretting the too frequent appeals he makes to phylogeny in order to give importance to characters which, from a strictly systematic point of view, must be regarded as trivial and had better be omitted from specific diagnoses. I have pointed out on various occasions† that some of the lepidosis characters on

* I have looked for these teeth in a large number of examples of the typical form without ever succeeding in finding any. Siebenrock (Sitzb. Akad. Wien, ciii. i. 1894, p. 254) must therefore, in all probability, have had skulls of some other form before him when he wrote that six or seven pterygoid teeth are present in *L. muralis*. As his specimens are stated to be from Dalmatia, it is most likely that they belong to one of those pyramidocephalous forms which were grouped by Bedriaga under *L. muralis neapolitana*.

† Proc. Zool. Soc. 1904, ii. p. 333; Nov. Zool. xii. 1905, p. 75; Trans. Zool. Soc. xvii. 1905, p. 351.

which he lays stress hopelessly break down when put to the test of large series from more extensive areas than it is the custom for faunists to deal with. An interesting example of the danger of hasty generalizations of this kind has just come under my notice.

As I mentioned in describing the typical form of *Lacerta muralis**, one of the two specimens (topotypes) from near Vienna, received from my ever-obliging friend Dr. Werner, proved to be highly aberrant in several respects. The parietal shields were abnormally divided by a transverse cleft. On recently enquiring from Dr. Werner as to whether he had other examples from the same locality (Vöslau, near Baden, Lower Austria), I was greatly surprised to hear that an examination of his material had satisfied him that this division, instead of being anomalous or accidental, is the rule in Lower Austria. Among his specimens from Mödling, Baden, Vöslau, Reichenau, and Miesenbach, not one is without at least an indication of it, whilst he cannot find such a thing in any of his other specimens from various parts of Europe. In order to further confirm this observation, Dr. Werner has made excursions to Baden and Vöslau, whence he sent me six living examples, all showing a complete or incomplete cleft across the parietal shields. Therefore this anomaly, which very seldom occurs in other parts of the very extensive habitat of the wall-lizard, although it is frequent in the viviparous lizard †, appears to have become fixed in a small district near Vienna. E. Martin ‡ mentions the case of the inhabitants of a small secluded village in France, nearly all of whom, at the end of the eighteenth century, had an extra digit to both hands and feet; gradually, however, as intercourse with neighbouring communities became frequent, the deformity was wiped out. Some years ago, when reporting his interesting discovery of *Lacerta praticola* in a valley near Herkulesbad in Transylvania §, Prof. v. Mähely pointed out the frequent presence of an accessory shield between the interparietal and the occipital, observed in 48 specimens out of 78; and as it so happened that the unique specimen on which the species was established by Eversmann offered the same anomaly, which occurs

* Trans. Zool. Soc. xvii. 1905, p. 354, pl. xxv. fig. 4.

† In which it may be transmitted to the offspring, as shown by a female from the dunes near Ostend, which produced four young in captivity (Aug. 4-7), all showing the same anomaly.

‡ Histoire des Monstres, 1880. Quoted from Delage, L'Hérédité, p. 194.

§ Math. Naturw. Ber. Ungarn, xii. 1894, p. 255, and Zool. Anz. 1895, p. 474.

occasionally in many other species of lizards, he was led to regard it as "ein ausgesprochenes Merkmal der Art [*L. praticola*], das mit der Zeit wohl eine vollkommene Beständigkeit erlangen wird, besonders da drei Schildchen häufiger bei den Weibchen, zweie aber bei den Männchen auftreten und bei Lacertiden bekanntermaassen die weiblichen Charactere viel allgemeiner auf die Nachkommenschaft vererbt werden"*. Now the case of the *L. praticola* from the valley near Herkulesbad is analogous with that of the *L. muralis* near Vienna, for in other parts of the habitat of the former species the intercalated shield is only exceptional, as pointed out by Kessler and by Bedriaga†, not being found in any of the fifteen specimens from Caucasia examined by them; it is absent in the three specimens from Sukum Kaleh, Caucasia, and in six out of the nine from the Comana Forest, Roumania‡, preserved in the British Museum. And yet Prof. v. Mähely included this character of the three azygous shields between the parietals among the points which, in his opinion, militate in favour of regarding *L. praticola* as more nearly related to *L. muralis* ("besonders die auch bei *L. muralis* häufige Querteilung des Interparietale") than to *L. vivipara*§.

Needless to say, the intercalation of a shield between the interparietal and the occipital (or division of the interparietal) occurs occasionally also in *L. vivipara*. I have before me specimens presenting such an anomaly from Falmouth, Brussels, Talomitz Valley and Brosteni, Roumania, and Moscow. It should also be mentioned that a few (two to four) granules may be present between the supraoculars and the supraciliaries in *L. vivipara*, whilst, on the other hand, these granules may be reduced to three or four in *L. praticola*.

Great is no doubt the interest attaching to the record of such individual deviations from the normal condition, great is also the danger of introducing them in the diagnosis of species.

I seize this opportunity to point out that the genus *Apathya*, recently proposed by Mähely|| for *Lacerta cappadocica*, Werner, does not seem separable from *Latastia*, Bedriaga. I am indebted to Dr. Werner for a specimen of *Latastia cappadocica*, and Dr. J. Roux has shown me another (labelled as from Mesopotamia). The structure of the digits

* I am not aware of any evidence in support of this statement.

† Zool. Anz. 1895, p. 261.

‡ I am here at variance with Kiritezeu, Bull. Soc. Sc. Bucarest, x. 1901, p. 313, but he does not state how many examples he has examined.

§ A view which has since been abandoned (cf. Ann. Mus. Hung. ii. 1904, pp. 375 & 377).

|| Termész. Közlön., Budapest, lxxxv. 1907, p. 2

is similar to that of *L. longicaudata*, so is the shape of the posteriorly narrowed frontal shield, with truncate antero-lateral angles, and the coloration, as described and figured by Werner, is highly suggestive of some examples of that species. The three shields behind the nostril ("postnasals" of Werner) cannot be regarded as a generic character, especially in view of the well-known variability of these shields in the type species of the genus *Lacerta*. Nor can generic importance be ascribed to the scaling of the lower eyelid if we bear in mind the modifications which it undergoes within the limits of the genera *Lacerta* and *Eremias*.

VI.—*Description of a new Engystomatid Frog of the Genus Breviceps from Namaqualand.* By G. A. BOULENGER, F.R.S.

[Plate II.]

Breviceps macrops. (Pl. II.)

Head comparatively larger and body less gibbose than in *B. gibbosus* and allies, eyes much larger, their diameter $6\frac{1}{2}$ to 8 times in the length of head and body; interorbital space narrow, barely half the width of the upper eyelid. Digits shorter and thicker than in the other species of the genus; first and second fingers equal, twice as long as the fourth, a little shorter than the third, which is not longer than the eye; toes extremely short, increasing in length from the rudimentary first to the fourth, which is not longer than the third finger, the fifth as long as the second; subarticular tubercles very small, very feebly prominent under the fingers,



Lower aspect of hand and foot.

absent under the toes; two large, feebly prominent metatarsal tubercles, the inner longer than its distance from the extremity of the first toe. Body with small smooth warts above, limbs and lower parts smooth. Pale sand-colour above, with

dark brown spots or marblings; a broad dark angular or curved band from one eyelid to the other across the back of the head and a narrow straight dark streak across the forehead, between the anterior borders of the upper eyelids; upper lip, limbs, and lower parts white.

| | mm. |
|--------------------------|-----------------|
| From snout to vent | 48 |
| Head | 13 |
| Width of head | 17 |
| Diameter of eye | 6 |
| Interorbital width | 2 $\frac{1}{2}$ |
| Width of mouth | 12 |
| Fore limb | 22 |
| Hand | 10 |
| Hind limb | 30 |
| Foot | 13 |

I am indebted to my friend Mr. L. Péringuey, Director of the South African Museum, for three specimens of this most distinct new species, one of which he has kindly presented to the British Museum. Mr. Péringuey, who has been able to keep them alive for some time, writes to me that they spend the whole day buried in damp sand. At night the pupil, which contracts to a narrow horizontal slit, expands over nearly the whole eye. Like *B. gibbosus*, this frog, when teased, or merely touched, inflates its body tremendously and utters shrill screams—a habit which seems to be frequent among burrowing batrachians whatever their affinities. Unlike *B. gibbosus*, *B. macrops* does not cover itself with a viscous secretion when alarmed.

EXPLANATION OF PLATE II.

Breviceps macrops, adult and half-grown.

VII.—*Descriptions of a new Toad and a new Amphisbænid from Mashonaland.* By G. A. BOULENGER, F.R.S.

[Plate III.]

IN November last I had the pleasure of drawing attention in these 'Annals' to the Chirinda Forest in S.E. Mashonaland, where Mr. Guy H. K. Marshall had discovered a new chamæleon of the genus *Rhampholeon*. I remarked that its reptile and batrachian fauna, when explored, was likely to afford further startling additions to South-African herpetology.

A small collection, including examples of only two species, was since made there by Mr. C. F. M. Swynnerton, and has been presented by him to the British Museum. The following descriptions show that there was some foundation for my optimism.

Bufo anotis. (Pl. III.)

Crown without bony ridges; head as long as broad; snout pointed, projecting beyond the mouth, with strong canthus; loreal region nearly vertical, concave; interorbital space flat, a little broader than the upper eyelid; no tympanum, no eustachian tubes. Fingers short, blunt, with strong double subarticular tubercles, first and second equal; toes short, one-third webbed, the web covered with coarse granules; subarticular tubercles under the fourth toe double and very prominent; two round, subconical, metatarsal tubercles; no tarsal fold. The tibio-tarsal articulation reaches the posterior border of the eye. Upper and lower parts covered with small smooth warts; parotoid glands very large, moderately prominent but well defined, only a little longer than broad, extending on the sides to the base of the arm. Upper parts brown and sides of head and body blackish, or entirely blackish above; limbs, if light-coloured, with blackish cross-bars; lower parts bright gamboge-yellow, the breast speckled with black. Male without vocal sac.

From snout to vent 40 mm.

Three male specimens, in nuptial dress, from small holes containing water at the foot of large trees.

This remarkable new toad agrees with *B. Preussi*, Matschie, and *B. taitanus*, Peters, in the absence of a tympanum. It is readily distinguished from the former by the warty integument and the distinct parotoid glands, from the latter by the more pointed snout with less oblique lores and the much larger parotoids extending down the sides.

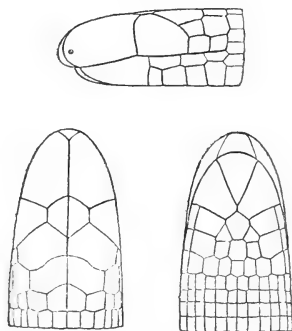
CHIRINDIA, gen. nov.

Distinguished from *Amphisbæna* by the absence of an ocular shield, the eye being situated under the posterior part of a large shield (nasal + labial + præfrontal + ocular) covering each side of the snout, and by the absence of præanal pores. Teeth very small.

Chirindia Swynnertoni.

A small triangular rostral, a pair of large shields covering the snout, a pair of small frontals in contact with a large

shield extending to the oral border, a pair of postfrontals and a pair of parietals, both broader than long, and four small square shields between them and the oral border; four lower labials, first very large and forming a short suture with its fellow behind the point of the elongate symphysial. 246 annuli on the body and 24 on the tail; in the middle of the body an annulus contains 24 segments, 12 above and 12 below the lateral lines; dorsal and lateral segments a little longer than broad, the two median ventrals about twice as broad as long. Lateral line moderately distinct. Anal segments scarcely enlarged. End of tail rounded. Flesh-coloured, tinged with purplish.



Chirindia Swynnertoni.

Total length 135 mm.; diameter of body 3; length of tail 14.

A single specimen of this remarkable Amphisbænid worm-like lizard was obtained. In the fusion of the ocular with the large paired shield which covers the whole of the snout, in addition to the small azygous rostral, *Chirindia* resembles *Placogaster*, Blgr., the unique species of which inhabits Senegambia; but it is at once distinguished from that genus by the paired ventral shields and the absence of preanal pores. *Chirindia* is certainly, with *Placogaster*, the most remarkable type of Amphisbænid discovered within the last twenty-five years.

VIII.—*Description of a new Cichlid Fish from Portuguese East Africa.* By G. A. BOULENGER, F.R.S.

A SMALL series of fishes obtained by Mr. C. M. F. Swynnerton in the Idunda River, a limestone-stream flowing into the lower Buzi River, in Portuguese Gazaland (altitude about 100 feet), and presented by him to the British Museum, consists of examples of *Barbus decipiens*, Blgr., *Tilapia shirana*, Blgr., *T. melanopleura*, A. Dum., and a new species of *Tilapia*, here described.

Tilapia Swynnertoni.

Depth of body $2\frac{1}{2}$ times in total length, length of head 3 times. Snout obtuse, with straight or convex profile, as long as the eye, which a little exceeds interorbital width and is contained $3\frac{1}{3}$ times in length of head; mouth extending to below anterior border of eye or a little beyond; maxillary exposed at the end; lips rather thick; 3 series of tricuspid teeth and an outer series of rather large bicuspid teeth (40 to 42 in the upper jaw), the cusps subequal and very obtuse; 3 or 4 series of scales on the cheek; large scales on the opercle. Gill-rakers short, 8 on lower part of anterior arch. Dorsal XV 9–10; spines increasing in length to the last, which measures nearly half length of head; longest soft rays $\frac{2}{3}$ length of head. Anal III 8–9; third spine shorter than last dorsal. Pectoral barely $\frac{3}{4}$ length of head, not extending to origin of anal. Ventral reaching origin of anal or a little beyond. Caudal rounded. Scales ctenoid, 29–31 $\frac{2\frac{1}{2}-3}{10-11}$; lateral lines $\frac{20-22}{10-11}$. Dark olive-brown, with ill-defined black cross-bars; a black vertical bar below the anterior half of the eye and a black opercular spot; fins grey; male with two or three round yellow spots on the anal.

Total length 95 mm.

Described from three specimens.

This species bears a great resemblance to *Hiplochromis Moffati*, Casteln. (*Chromis philander*, M. Weber), but differs in the dentition and in the larger eye.

IX.—*Descriptions of Three new Freshwater Fishes discovered by Mr. G. L. Bates in South Cameroon.* By G. A. BOULENGER, F.R.S.

Synodontis Batesii.

Depth of body $3\frac{1}{2}$ to $4\frac{1}{3}$ times in the total length, length of head 3 to $3\frac{1}{2}$ times. Head a little longer than broad, rugose

above; snout obtusely pointed, as long as postocular part of head; eye supero-lateral, its diameter 4 to $5\frac{1}{2}$ in length of head, $1\frac{2}{3}$ to $2\frac{1}{4}$ times in interorbital width; præmaxillary teeth forming a short and broad band; movable mandibular teeth not half diameter of eye, 30 to 40 in number; maxillary barbel not distinctly margined, extending about to middle of pectoral spine; mandibular barbels with obtuse or tubercular branches, outer at least twice as long as inner and $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Gill-openings not extending downwards beyond root of pectoral spine. Occipito-nuchal shield rough like the occiput, obtusely tectiform, not or but slightly longer than broad, the posterior processes rounded. Humeral process rugose, acutely pointed, extending as far back as occipito-nuchal process. Skin without villosities. Dorsal 17; spine nearly as long as head, striated, strongly serrated in front, with a few very feeble serræ behind. Adipose dorsal rather small, not longer than its distance from the rayed dorsal. Anal III 8-9. Pectoral strongly serrated on outer side, still more strongly on inner. Caudal fin deeply notched, crescentic. Caudal peduncle longer than deep. Brown, blotched and marbled with darker, with three broad irregular dark bands, the first below the dorsal fin, the second below the adipose, the third in front of the caudal fin; fins whitish, with round black spots.

Total length 90 mm.

Several specimens from the Ja River.

The smallest specimens of the genus. The first specimens received were thought by me to be young *S. obesus*, Blgr., a species which has not yet been discovered in Cameroon.

Clarias longior.

Depth of body 8 to 9 times in total length, length of head 5 to $5\frac{1}{2}$ times. Head extremely depressed, once and $\frac{1}{4}$ as long as broad, smooth; occipital process very short, pointed; frontal fontanelle knife-shaped, about 3 times as long as broad; occipital fontanelle smaller, in advance of occipital process; eye very small, $2\frac{1}{2}$ times in length of snout, 5 or $5\frac{1}{2}$ times in interorbital width, which equals width of mouth and $\frac{1}{2}$ length of head; band of præmaxillary teeth 4 times as long as broad; vomerine teeth granular, forming a curved band which is as broad as the præmaxillary band; nasal barbel $\frac{2}{3}$ to $\frac{3}{4}$ length of head, maxillary once and $\frac{1}{4}$ to once and $\frac{1}{2}$, outer mandibular once, inner mandibular $\frac{2}{3}$ to $\frac{3}{4}$. Gill-rakers very few, 12 on anterior arch. Clavicles concealed under the skin. Dorsal 80, its distance from occipital process $\frac{3}{5}$ to $\frac{2}{3}$ length of

head, its distance from the caudal equal to diameter of eye. Anal 70-73, nearly reaching the caudal. Pectoral $\frac{3}{5}$ to $\frac{2}{3}$ length of head, the spine smooth and about $\frac{2}{3}$ the length of the fin. Ventral once and $\frac{2}{3}$ to once and $\frac{3}{4}$ as distant from base of caudal and from end of snout. Caudal $\frac{2}{3}$ length of head. Dark brown above, whitish beneath.

Total length 225 mm.

One specimen from the Kribi River and one from the Lobi River.

Eleotris kribensis.

Body cylindrical or a little compressed, its depth 4 to 5 times in total length; length of head 3 to $3\frac{1}{2}$ times in total length. Head broader than deep, naked; snout broad, rounded, as long as or a little longer than the eye, the diameter of which is 4 to $4\frac{1}{2}$ times in length of head and equal to or a little less than interorbital width; lower jaw projecting; maxillary extending to below anterior third or centre of eye; no canine teeth; no præopercular spine. Dorsals VI, I 8-9, well separated from each other, longest rays not longer than head. Anal I 7, opposite to second dorsal. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, a little longer than ventral. Caudal rounded, a little shorter than head. Caudal peduncle once and $\frac{1}{2}$ to once and $\frac{2}{3}$ as long as deep. Scales smooth on the nape, strongly ciliated on the body, 32 to 35 in a longitudinal series, 12 between origin of dorsal and anal. Yellowish to brown, dotted with darker, with or without five or six ill-defined dark cross-bands; a blackish bar at the root of the caudal fin; fins brown or blackish and white-edged in males, whitish with blackish spots in females.

Total length 50 mm.

Numerous specimens from the Kribi River.

X.—*The Atractylis coccinea* of T. S. Wright.

By E. S. RUSSELL, M.A.

THIS hydroid was described by Wright (Ann. Nat. Hist. ser. 3, viii. (1861) p. 130) in the following words:—

“*Atractylis coccinea*, n. sp.

“Polypidom creeping, widely reticulate. Polyp fusiform, set at an obtuse angle to its stalk, rich crimson or pink, with eight alternating tentacles, four long and four short.”

No gonophores were found. Hincks ('Hydroid Zoophytes,' 1868) provisionally transferred the species to the genus *Perigonimus*. Allman does not mention it at all, and I have not been able to find any subsequent record of it.

In 1905 I obtained near Millport Marine Biological Station numerous specimens of what is almost certainly the *Atractylis coccinea* of Wright. They differ from Wright's specimens in having twelve equal tentacles, but they all have the hydranth set at an obtuse angle with the stalk, a very characteristic point.

The species was not figured by Wright, and his description was in some respects incomplete. I therefore give here a detailed description of my specimens and a figure.

The species must be assigned to the genus *Wrightia*, Allman (1872). The genus *Atractylis*, Wright (1859), contained forms which are now distributed among the genera *Bougainvillia*, *Perigonimus*, and *Wrightia*. Hincks's genus *Atractylis* is synonymous with Allman's *Wrightia*, but the name *Wrightia* is to be preferred, since *Atractylis* is the long-established name of a genus of plants. *Wrightia*, when constituted by Allman, contained one species, *Wrightia arenosa* (*Atractylis arenosa*, Alder, Suppl. Catalogue, p. 7, pl. x. figs. 5-7), and the diagnosis of the genus contained some of the *specific* characteristics of *Wrightia arenosa* (Alder), namely, the funnel-shaped stems, the retractile hydranth, and the position of the gonophores on the hydrocaulus. I propose the following definition of the genus, which is in all essentials the same as Allman's definition, but leaves out any reference to the purely specific characters of either of the two species which the genus contains, *arenosa* (Alder) and *coccinea* (Wright).

WRIGHTIA.

Atractylis (in part.), Wright, Edin. New Phil. Journ. ix. p. 106 (1859).

Atractylis, Hincks (1868).

Wrightia, Allman (1872).

Hydrocaulus erect, unbranched, arising from a creeping hydrorhiza. Perisarc expanding above to form a protective sheath which clothes the hydranth up to the base of the tentacles.

Reproduction by fixed sporosacs, which are partially or wholly invested by a chitinous envelope.

Wrightia coccinea (Wright).

Atractylis coccinea, Wright (1861).

Perigonimus (?) *coccineus*, Hincks (1868).

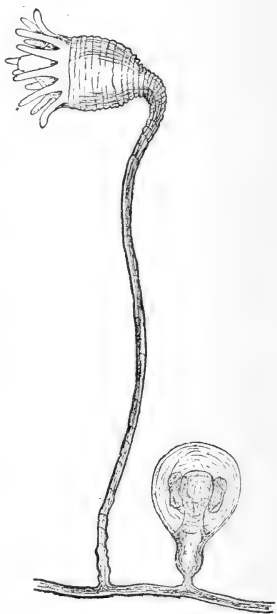
Trophosome.—The hydrocaulus consists of a number of short stems $\frac{1}{4}$ – $\frac{1}{2}$ inch in length (slender, somewhat contorted, unbranched, or with small offshoot bearing a hydranth), which arise at short intervals from a creeping and anastomosing hydrorhiza, which resembles the stems. The hydranth makes an obtuse angle with the stem. It is closely invested up to the roots of the tentacles by a hydrothecal expansion of the perisarc, but is not retractile into it. The tentacles are 10–12 in number, short and straight, disposed in a single verticil round the bluntly conical hypostome. The perisarc is straw-coloured, and is wrinkled transversely where it expands to cover the hydranth. The colour of the hydranth is pink, turning to white at the tip of the hypostome. The tentacles are translucent white; the cœnosarc pink to scarlet.

Gonosome.—The gonophores are sporosacs. They are globular and arise from the hydrorhiza, to which they are attached by a slender pedicel. They are invested by a chitinous covering which is continuous with the perisarc. There is a short blunt spadix, in the outer layer of which the gametes are matured.

The gonophore resembles in structure that of *Garveia nutans*, as figured by Allman ('Gymnoblasic Hydroids,' i. p. 44).

The colour of the gonophore is translucent white; the spadix is brick-red; the gametes pink.

Wrightia coccinea was taken by Wright at Inch Garvie, Firth of Forth, on the roots of *Laminaria saccharina*, and by the writer at Hunterston Perch, near Fairlie, Firth of Clyde, in 12 fath., on *Tubularia*, and in Castle Bay, Little Cumbrae, in 15–20 fath., also on *Tubularia*. It is common where it



Wrightia coccinea.

does occur. I obtained my specimens in May and June, and they bore numerous gonophores.

In studying *Wrightia* and the allied genera one cannot help noticing their resemblance to Calyptoblasts. The family Bougainvilliidae, to which they belong, is practically alone among Gymnoblastea in possessing a single verticil of filiform tentacles surrounding a conical hypostome. All the Calyptoblasts have this conical hypostome and single verticil of filiform tentacles. Further, many of the genera of Bougainvilliidae have quite a distinct protective cup for the hydranth, resembling greatly the hydrotheca of the Calyptoblast. Indeed, were it not for the fact that these genera are classified with the Gymnoblastea, their protective cups would receive the name of hydrothecæ.

These facts point to the conclusion that a close relationship exists between the family Bougainvilliidae and the suborder Calyptoblastea. The Bougainvilliidae, perhaps, form a transition-stage between the suborders Gymnoblastea and Calyptoblastea.

XI.—*On the Generic Position of Benson's Helix hyba and the Similarity of its Anatomy to that of Khasiella vidua, W. T. Blanford.* By Lt.-Colonel H. H. GODWIN-AUSTEN, F.R.S. &c.

EVER since the discovery of this species about 1860 it has been impossible to locate it in any Indian genus without considerable doubt. It is apparently very rare. I have never come across it in the field, and I do not think it is to be found in many collections. I am informed by Mr. S. F. Harmer, of the University Museum of Zoology, Cambridge, that two specimens (Benson's types) are in the MacAndrew collection. Fortunately I have recently discovered two specimens among some other species preserved in spirit by Mr. W. Theobald, marked "Chamba," a small State in the N.W. Himalaya, S.E. of Kashmir Territory. The one from which the subjoined description was taken was in a very good state of preservation. All we knew with any certainty was that it belonged to the Zonitidae, Mr. Theobald having noted the presence of the mucous gland at the extremity of the foot at the time of capture.

Mr. Benson described the shell in the *Ann. & Mag. Nat. Hist.* ser. 3, vol. vii. (Feb. 1861), in his usual excellent way, and goes on to say:—

"This interesting form, discovered in the mountains near the Bari Do-āb by J. Doyle Smithe, Esq., F.G.S., of Madhopore, and kindly communicated to me by his brother, the Rev. Fred. Smithe, of Churchdown, approaches more nearly to the Nilgherry *H. Guerini*, Pfr., than to any Himalayan species. It is notable for its shorter vaulted spire, sharp keel, rather open umbilicus, and sculpture. In one imperfect specimen, with a higher and more rounded hive-shaped spire, the keel of the penultimate whorl overhangs the anterior part of the last whorl."

We now know that *H. Guerini*, Pfr., is a *Thysanota* in a very distinct family of Land-Mollusca. The overhanging of the keel of the whorl I note in these shells, and it produces the appearance of a thread running with the suture. Theobald records the finding of a large variety of this species at "Aijas" ("Ajjas" on the map of Kashmir, 2 m.=1 inch), in the hills east of the Walar Lake, Kashmir, measuring $17\frac{1}{4} \times 16\frac{3}{4} \times 10$ mm. This shell appears to have been lost.

The specimen Benson described measured: diam. major 14 mm., minor 13, axis 7; the one I now figure: $12 \times 11.5 \times 5\frac{1}{2}$ respectively.

On removing the shell the visceral sac is pale-coloured, sparsely and finely spotted with black on the line of the rectum. The foot is short and very narrow, indistinctly divided, dark grey; a distinct mucous gland overhung by a blunt lobe, peripodial grooves, and a well-marked fringed margin to the foot. There is a small but distinct and serrated right shell-lobe, which would spread further in life; the left is a marginal band on the edge of the peristome. The generative organs were of great interest as they were unfolded. The amatorial organ is of the usual form; the penis retractor muscle given off from a distinctly coiled cæcum at the head of the main penis-sheath. There is a long epiphallus thence to the junction of the vas deferens, with a long kalc-sac adjacent in which a spermatophore had been developing. The spermatheca is very long, gradually enlarging to the distal end, and contained three spermatophores; these are of the type I have described in various species of *Macrochlumys*, *Austenia*, &c. The flume had no large spines, but very minute ones could be detected on the edges of it. This being a single specimen, which I have mounted in glycerine-jelly, I did not like to destroy the sac of the spermatheca to get a spermatophore out entire. In separating out the lengthened genitalia of a close-wound shell such as this is, it is not easy to do so without occasionally something breaking away. The oviduct is peculiar, very straight up to the albumen-gland,

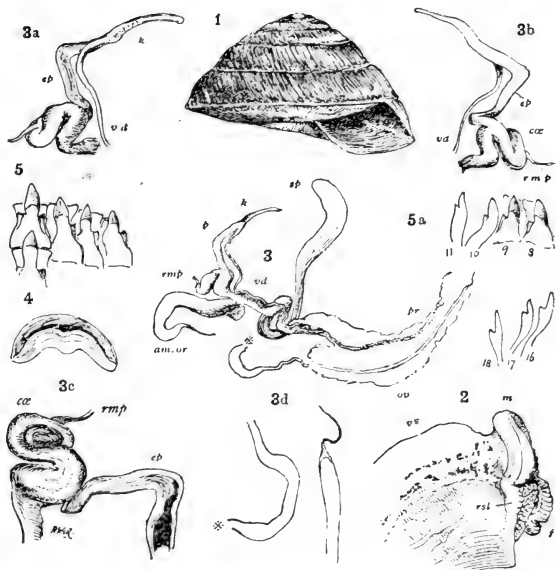


Fig. 1.—*Khasiella hyba*, Bs.; shell. $\times 4.8$.

Fig. 2.—Side view of mantle-edge from right side, showing the obscure right shell-lobe, foot, &c. $\times 8$.

Fig. 3.—Genitalia. $\times 4.5$.

Figs. 3a, 3b.—The penis, as seen from two opposite sides, to show the coiled caecum and position of the retractor muscle attachment, the kalc-sac or flagellum, &c. $\times 8$.

Fig. 3c.—A portion of same organ more enlarged, slightly pressed between two glass slips and viewed by transmitted light, to show the close-coiled caecum; the dark portion is part of a spermatoaphore. $\times 12$.

Fig. 3d.—Terminal end and distal end of an organ not located in the genitalia and with which it may have no connexion. $\times 12$.

Fig. 4.—Jaw. $\times 24$.

Fig. 5.—Central tooth and three admedian teeth of the radula. $\times 368$.

Fig. 5a.—Eighth to eleventh admedian and sixteenth to eighteenth lateral teeth.

ep. Epiphallus.
k. Kalc-sac or flagellum.
vd. Vas deferens.
cae. Caecum.
p. Penis.

rmp. Retractor muscle of penis.
am.or. Amatorial organ.

pr. Prostate.
rsl. Right shell-lobe.
f. Foot.
vs. Visceral sac.
ov. Oviduct.

so was the line of the prostate; but lying nearly parallel to this I observed a long narrow ribbon—no doubt a duct—lying on the surface of the jelly-like oviduct, of a hard nature and ochraceous in colour, clearly pointed and with a fine retractor muscle, while floating free among the parts of the genitalia was a similar-sized duct with a swollen open end, where it had evidently broken away. This may be an accessory gland of some kind given off from the free oviduct or base of the spermatheca. It might very easily have been set down as a spermatophore, but fortunately in this case the spermatophore of this species is before me, and narrows its possible function and connexion with the genitalia considerably. We must wait for more material to clear up this point.

The second specimen, the shell of which is here figured (p. 57), I do not like to destroy, as the species would appear to be so rare.

The jaw is strong and solid, slightly arched into a central projection.

The radula has the formula

$$\begin{array}{ccccccc} 18 & . & 2 & . & 9 & . & 1 & . & 9 & . & 2 & . & 18 \\ & & & & & & 29 & . & 1 & . & 29. \end{array}$$

The teeth are of the usual form in so many genera of the Zonitidæ, the laterals being bicuspid, with the outer cusp below the inner, becoming very small on the margin.

On comparing these anatomical details with those of other Indian species, I find there is a remarkable similarity to those of the genus *Khasiella* (Godwin-Austen, Moll. Ind. vol. ii. p. 129, pl. c. figs. 1–5 *d*) as seen in the type species *vidua*, W. T. Blanf. There is (1) the same small obscure right shell-lobe; (2) same form of foot and mucous gland; (3) the jaw and radula are precisely alike; (4) the generative organs differ in no appreciable way, merely that the short free cæcum retractoris penis of *vidua* becomes a close-wound coil in *hyba*, and is thus similar to the same part in *Macrochlamys indica*.

It is extremely interesting to find such close resemblance in the anatomy of two land-molluscs with such very distinct forms of shell as presented in *hyba* and *indica*; differing so widely, conchologically they would take their place in separate genera. The shells of *vidua* and *hyba* also present at first sight considerable differences, but the variation becomes less apparent when *hyba* is compared with the sharply keeled species of *Khasiella*, such as *climacterica*, Bens., and *Austeni*, W. T. Blanf.

I think I am right in considering *H. hyba* by its anatomy to

belong to the genus *Khasiella*, with these shell-characters :—
Openly umbilicated ; sharply keeled ; spire very conoid, with
sides and apex very convex.

Nore, Godalming,
5th June, 1907.

XII.—*Descriptions and Records of Bees.*—XV.
By T. D. A. COCKERELL, University of Colorado.

Triepeolus Noræ, sp. n.

♀.—Length about $8\frac{1}{2}$ mm.

Black, with the usual markings only slightly yellowish ;
hair on middle of face pure white ; legs clear red, spurs of
middle and hind legs black ; no red colour on thorax ; tegulæ
apricot-colour ; scutellum low, obscurely bilobed, the lateral
teeth black and short. Clypeus shining, with many very
minute punctures and a few large ones ; mandibles red except
at base and apex ; labrum black, a little reddish at sides ;
first three antennal joints and base of fourth ferruginous ;
sides of vertex with large well-separated punctures on a
shining ground ; mesothorax exceedingly densely punctured,
the two median stripes of hair short, not attaining the ante-
rior margin ; pleura hairy in front and with a large transverse
patch of hair ; lower part of pleura densely punctured, but
at one place a little of the shining surface shows ; dark trans-
verse mark on first abdominal segment essentially as in
T. occidentalis, but the posterior band interrupted ; segments
2 to 4 with even entire bands, that on 2 with lateral processes
directed forwards so as to make with the band an angle of
about 45° ; sides of fifth segment with white tomentum ; last
ventral segment normal.

In nearly all respects exactly like a small edition of
T. occidentalis, but the hair of the abdomen is less yellow,
the pygidial patch is narrower, and the scutellar teeth are
less developed. In size and general appearance it closely
resembles *T. callopus*, Ckll. The colour of the spurs will
readily separate it from *T. Hopkinsi*.

Hab. Mesilla Park, New Mexico, at flowers of *Sphaeralcea*
lobata, Wooton, May 16 (*Miss Nora Newberry*).

Triepeolus remigatus (Fabr.).

Mesilla, New Mexico, June 30 (*Cockerell*).

This is the true *remigatus*, as defined by Cresson and

Robertson, and is new to New Mexico. The species has a wide range eastward. Mr. N. Banks sends me specimens from Glencarlyn, Virginia, July 26, and Falls Church, Virginia, Aug. 7, ♀ at flowers of *Eupatorium linearifolium*.

Triepeolus agaricifer, sp. n.

♂.—Length 9 mm. or rather more.

Black, with the *markings orange-buff*, all the abdominal bands of the same colour; legs red, the coxæ and trochanters black, anterior femora black above except at apex, middle femora mainly black above and beneath, hind femora black, with a broad red stripe above; hind tibiæ with a large black patch behind; *spurs red*. Middle of mandibles red; labrum black; *hair of face orange*; antennæ black, the third joint with a large red mark in front; vertex very coarsely punctured; mesothorax very coarsely punctured, with two very distinct stripes which reach the anterior margin, which latter has no light border; markings of thorax as usual; tegulæ and most of tubercles red; scutellum entirely black, strongly bigibbous, with short but very distinct lateral teeth; lower part of pleura showing a black (but not entirely nude) area, which is densely and coarsely punctured. Wings with the apical margin broadly dark fuliginous; stigma red; nervures fuscous; second s.m. much narrowed above. Abdomen broad, with all the bands broad and perfectly entire, except the basal one on the first segment, which is rather broadly interrupted; black median mark on first segment transversely fusiform, with obliquely truncate sides, much shorter than in *T. helianthi*, but not triangular as in *T. lunatus*; band on second segment with a broad low prominence on each side in front, but no projection forming an angle; apical plate black, narrow.

Looks at first sight like a small *T. lunatus*, but easily separated by the characters italicized.

Hab. Beulah, New Mexico, August (*Cockerell*).

The name *agaricifer* is derived from the black mark on the first abdominal segment, which, when the insect is seen from the front, looks like an agaric.

Epeolus argyreus, sp. n.

♂.—Length about $8\frac{1}{2}$ mm.

Black, but largely covered with the usual pubescence, which on the abdomen is pale cinereous with a yellowish tint, on the thorax above the same, but on the face and pleura (both of which are entirely and densely covered) brilliant

silvery white. Eyes pale green. Antennæ brown-black, the third joint partly red. Mesothorax covered with appressed hair, except a somewhat U-shaped patch posteriorly; area of metathorax nude, surrounded by dense hair on all sides; tegulæ very hairy, piceous, with reddish margins. Wings hyaline; in the type the upper half of the second t.-c. is wanting on both sides. Legs black, with silvery hair, that on inner side of basitarsi golden; small joints of tarsi ferruginous; spurs of middle and hind legs black; first abdominal segment covered with light hair, except a slender transverse band, which is only moderately long and is ill-defined at the ends; all the light bands entire and broad, that on second segment greatly enlarging laterally, but the enlargement forming with the band a very obtuse angle; erect fringe on fourth and fifth ventral segments fuscous.

Hab. North Yakima, Washington State, Aug. 4, 1903
(*Eldred Jenne*).

Epeolus bihamatus, sp. n.

♂.—Size, colour, and general appearance agreeing with *E. argyreus*, with the same silvery hair covering the pleura, though not quite so densely, and also on the face, though failing below, so as to leave the lower part of the very minutely and densely punctured clypeus visible. The black spurs also are the same, and the hyaline wings. The following differences are important:—Mandibles with more red; margin of labrum red; face less narrowed below; third antennal joint longer; flagellum ferruginous beneath except at base; mesothorax less hairy, leaving a large anchor-shaped black area very densely punctured, its stem reaching the anterior margin; tegulæ piceous basally, red in the middle, and with hyaline margin; area of metathorax almost entirely covered with hair; marginal cell less slender; second t.-c. complete; knees, femora, and tibiæ red; transverse band on first abdominal segment large and clean-cut; band on second segment with a large hook-like process on each side; erect fringe on fourth and fifth ventral segments white.

Hab. North Yakima, Washington State, June 26, 1903
(*Eldred Jenne*).

This species and the last are very distinct by the general appearance and hairy pleura, together with the black spurs, from the other American members of the genus.

The following three species of *Triepeolus* superficially resemble *T. lunatus* and *helianthi*, and were confused with

those species until critically examined. A table is offered to facilitate their separation :—

Females.

| | |
|--|----------------------------|
| Black mark on first abdominal segment distinctly triangular, the lateral corners pointed | <i>lunatus</i> , Say. |
| Black mark on first abdominal segment a transverse band | 1. |
| 1. Anterior femora red | <i>segregatus</i> (Ckll.). |
| Anterior femora black, or black with a red stripe. | 2. |
| 2. Pleura hairy all over, though more thinly below. | <i>Townsendi</i> , Ckll. |
| Lower part of pleura bare | <i>helianthi</i> , Rob. |

Males.

| | |
|---|----------------------------|
| All, or nearly all, of the abdominal bands narrowly interrupted | <i>sublunatus</i> , Ckll. |
| The bands beyond the first segment all, or nearly all, entire | 1. |
| 1. Larger; anterior femora black; pleura hairy all over | <i>Fraseræ</i> (Ckll.). |
| Smaller; anterior femora red and black, or red.. | 2. |
| 2. Pleura hairy all over | <i>Townsendi</i> , Ckll. |
| Lower part of pleura bare or little hairy | <i>segregatus</i> (Ckll.). |

Tripeolus sublunatus, sp. n. (*Cressonii*, Rob., race?).

♂.—Length 11 mm.

With a relatively long and narrow, cylindrical abdomen. Hair of face distinctly yellowish. Labrum, basal part of mandibles, and first three joints of antennæ red; the two stripes on mesothorax very clear and distinct; no band along anterior border of mesothorax, or patches of hair in the anterior corners; tegulæ bright ferruginous. Wings dusky; lower part of pleura with a bare, very densely punctured patch. Legs red, the anterior femora black, with the apex and the lower edge red; middle and hind femora with much black in front; spurs of middle and hind legs black; transverse band on first abdominal segment with broad anterior and posterior projections, the latter dividing the apical light band; all the abdominal bands practically of the same colour.

By the colour of the tegulæ this species is like *T. occidentalis*, Cresson, but it differs from that by the dark femora and interrupted abdominal bands. In Robertson's table (Canad. Entom., Oct. 1903) it runs to *T. Cressonii*, Rob., and agrees with the diagnosis there given, except as to the pleura. According to Robertson, *Cressonii* as found in Illinois is exceeding variable, and it may be that *sublunatus* represents a geographical form

of it *. In our insect the scutellum and tubercles show no red whatever, and the teeth at the sides of the former are very little developed. The second abdominal segment has the band hooked at the sides in one specimen, but the hook-like projection is wanting in the other, which is certainly conspecific. The marking of the mesothorax is very different from that of *Fraseræ*, which I described as a subspecies of *Cressonii*.

Hab. Dripping Spring, Organ Mts., New Mexico, Aug. 10 (C. H. T. Townsend). Two males.

Triepeolus segregatus (Ckll.).

♂.—Length about 10 mm.

Compact; labrum black and mandibles with little red; clypeus very densely punctured; hair of face silver-white. Antennæ black, or scape with a red spot in front, and third segment and base of fourth red; the two stripes of mesothorax very distinct; no pale anterior border; scutellum entirely black, the lateral teeth pointed but not long; pleura with a nude patch below, on which are scattered strong punctures on a shining ground; femora entirely red, or with suffused dusky patches.

♀.—Scutellum entirely black; the abdominal bands beyond the first segment entire, or that on the second inclined to be interrupted.

The female ascribed to *segregatus* in the original description probably represents a distinct species, or at least variety. I was misled by it into thinking the present insect distinct from *segregatus*, but I cannot see that the males are anything but true *segregatus*, and the females taken at the same time and place certainly belong with them. The insect is related to *T. pectoralis*, Rob., but the black band on the first abdominal segment is not so long, the tegulæ are differently coloured, and there are other differences. The spurs are brown, not black.

Hab. Dripping Spring, Organ Mts., Aug. 10, 2 ♂, 2 ♀ (C. H. T. Townsend).

Triepeolus Townsendi, sp. n.

In size, colour, and markings just like the *T. segregatus* from the Organ Mts., but differing as follows:—

* However, *E. Cressonii* was based primarily on the *mercatus* of Cresson (1878), and Cresson's full description appears to indicate an insect specifically distinct from *sublunatus*. Virginia is to be taken as the type locality.

♂.—The two stripes of mesothorax broader, broadly reaching anterior margin, and more or less connected with large patches of pale hair which occupy the anterior lateral corners; pleura densely covered with hair; teeth at sides of scutellum somewhat longer and appreciably curved inwards; spurs of middle and hind legs black; black band on first abdominal segment longer, rounded instead of obliquely truncate laterally, and without an anterior projection breaking the basal pale band; angles formed by lateral processes of band of second segment less acute; apical plate rounded. The antennæ and labrum are entirely black, and there is no red about the thorax.

♀.—Antennæ black; anterior lateral corners of mesothorax with pale patches; teeth at sides of scutellum smaller; pleura hairy, the lower part densely punctured. Wings hardly so dark; spurs black; apical pale band of first abdominal segment more broadly interrupted, but basal band not interrupted.

Hab. Rio Ruidoso, New Mexico, about 6700 ft., at flowers of *Erigeron macranthus*, July 27, ♂ (*C. H. T. Townsend*); Rociada, New Mexico, Aug. 8, ♀ (*Cockerell*).

ISEPEOLUS, gen. nov.

♂.—Similar in appearance and markings to *Epeolus*, but differing as follows:—Third antennal joint very long, longer than the scape; apical half of galea slender and elongated; labial palpi very long (the last two joints minute as usual); axillar teeth present but rounded, blunt; b. n. falling far short of t.-m.; submarginal cells subequal, but the third the largest; the second large, square, a little shorter below than first or third, receiving first r. n. near its end; third s.m. receiving second r. n. near its end; outer side of third s.m. strongly bulging; marginal cell with its apex obliquely truncate, the tip away from the costa, the part of the lower edge joining the s.m. cells a trifle shorter than the part beyond; apex of abdomen rounded, without a projecting plate, the upper surface of it covered with fine hair. The maxillary palpi appear to be quite as in *Epeolus*. Claws bifid; a very long pulvillus, as long as the claws, with a black apical disk.

For years I have had this insect marked "*Leiopodus?*"; but having seen the type of *Leiopodus* in the British Museum, it is evident that *Isepeolus* is very distinct by the oval abdomen, large but not especially peculiar hind coxæ, second s.m. a little narrower below than first, &c.

Isepeolus albopictus, sp. n.

♂.—Length about 8½ mm.

Black, with markings of white tomentum like those of *Epeolus*; mandibles rather feebly bidentate, dark reddish except at base; labrum black; face covered with white hair, but clypeus nearly all bare, dull and roughened with very minute punctures; apex of scape, and the following three joints entirely, red; the remaining part of the flagellum, which is stout, red beneath; mesothorax dull, with minute close punctures, anteriorly with two triangles of black hair surrounded by white, the anterior lateral corners also covered with white hair; tubercles red; upper part of pleura covered with white hair, lower part bare, densely punctured; scutellum bigibbous, red, with black hair at sides; postscutellum red, with white hair; metathorax black, the area bare; tegulae reddish. Wings clear, the apical field with dusky stains; stigma well developed, red; nervures dark fuscous. Knees, anterior and middle tibiae, apex and base of hind tibiae, and all the tarsi red; anterior tarsi long and slender; anterior and middle tibiae marked with two bars of white on the outer side, hind tibiae with a broad bar or patch on apical half; hind femora swollen; spurs ferruginous; first abdominal segment with white hair at base, a spot at each side, and a pair of semicircular marks on hind margin; second segment with a broadly interrupted band on hind margin, its proximal ends subclavate, its upper lateral margin with a very large bifid process or extension; third segment ornamented like second, except that the band is obsolete in the subdorsal region, leaving the proximal ends as spots; fourth segment with a pair of spots; fifth with two transverse hammer-shaped marks; sixth four-spotted; apex red; venter dark brown, with some white hair-spots.

Hub. Carcarana, Argentina; received from Mr. J. C. Crawford. Collected, I believe, by Professor L. Bruner.

I believe there are other specimens in the U.S. National Museum.

GRONOCERAS, gen. nov.

Large bees allied to *Megachile*, with the nesting-habits (cf. *G. combusta*) of *Chalicodoma*; male with flagellum excavated beneath, like a trough; abdomen with two long spines at apex; anterior coxae with very long spines; anterior tarsi pallid, broadened and flattened; claws bifid at apex; female with mandibles 2- to 4-dentate; scopa red or red and black; claws simple. The maxillary palpi are bristly.

The general build resembles that of *Chalicodoma*, but the structure of the apex of the abdomen and of the male antennæ is quite different.

Type, *G. Wellmani*, sp. n. Also including *G. combusta* (*Megachile combusta*, Sm.), *G. guineensis* (*Apis guineensis*, Fabr.), *G. tricolor* (*Megachile tricolor*, Friese), and *G. stuppea* (*Megachile stuppea*, Vachal).

Gronoceras Wellmani, sp. n.

♀.—Length 17–19 mm.

Black, including legs and antennæ, the hind margins of the abdominal segments ferruginous; hair of head, thorax, and legs black or brown-black, of abdomen bright fox-red, above and below, but largely black or dark fuscous on the first segment above; mandibles long, with two apical teeth, the rest of the cutting-edge toothless; clypeus normal, strongly punctured, the punctures well separated in the middle; mesothorax densely punctured and dull; tegulæ densely punctured, black, with dark ferruginous margin. Wings subhyaline, strongly yellowish.

Very nearly agreeing with *G. combusta*, but the wings are not nearly so dark.

♂.—Length 16–19 mm.

Like the female, except in the sexual characters mentioned in the generic diagnosis, but the hair of the first abdominal segment is red like that of the others (in *combusta* ♂ it is black); the hair of the face is light yellowish or yellowish white, with black hairs intermixed; the cheeks below have a fringe of long white hairs; the anterior tibiæ are more or less pale apically, with a little elevated keel in front; first basitarsus broad and flat, a sort of pale honey-colour, with a raised ferruginous keel or line along the outer anterior edge, short white hair on the outer surface, except basally and more or less anteriorly, where there are fuscous bristles, a fringe of dense short black hair on the anterior interior edge, and a long fringe of ferruginous-tipped hairs behind; second joint of anterior tarsus dark reddish or yellow, the remaining joints black, except that the tip of the last is red; extreme apex of middle tibiæ red; bases of claws red; red hind margins of abdominal segments very broad; venter of abdomen mainly red; apex of abdomen with some long dark hairs, and two long, straight, red-tipped spines, mesad of each (and springing from the same base) is a short inconspicuous spine; a red spine, easily overlooked, on each side of penultimate segment; anterior coxal spines long and

straight, reddish above. The second specimen, manifestly conspecific, has at the apex of the abdomen a pair of *short* black spines on one side and a single one on the other; it is asymmetrical and evidently abnormal. This male is also very like *G. combusta*, but separated by the much paler wings, red hair on first abdominal segment, form of apical teeth, &c.

Hab. Portuguese West Africa, long. E. $15^{\circ} 05'$, lat. S. $12^{\circ} 44'$, alt. 1360 metres, at flowering mint, *Eolanthus* sp., Dec. 1906 (middle of rainy season); two of each sex collected by Dr. F. Creighton Wellman.

Gronoceras benguellensis, sp. n.

♀.—Length about $16\frac{1}{2}$ mm.

Black, including legs and antennæ; hair of head, thorax, and legs brown-black, except that there is a little pallid hair about the bases of the antennæ, and the hair of the thorax above is dark coffee-colour on the mesothorax, becoming bright fox-red on hind part of scutellum and upper part of metathorax; the hair of the first two abdominal segments above is bright fox-red, but on the others black, the hind margins of the segments narrowly whitish; ventral scopa red in the middle and black at the sides, but entirely black on the last two segments. Wings dusky hyaline, the apex clouded; hind spurs red; mandibles 4-dentate, the third tooth truncate, the fourth very small.

♂.—Length about 13 mm.

Hair of face yellowish white, of cheeks below white, of vertex and occiput brown-black, of thorax and abdomen brown-black, without red; whitish at sides of abdomen beneath; apex of abdomen with a large stiff tuft or brush of long black hairs; abdomen above practically bare, the hind margins of the segments dark reddish; clypeus densely punctured, with a narrow shining median raised line; middle of mandibles with a large tubercle beneath (in *Wellmani* with a similar process, but hardly so large); labrum broadly rounded at apex; anterior tarsi formed in general as in *Wellmani*, but the apical joints are red, not black, and the basitarsus is greyish, with no anterior ferruginous line, but with a broad cream-coloured stripe down the anterior margin, and continued on to the second joint; the fringe of hair on the inner anterior edge is pale reddish instead of black, and the long posterior fringe extends as far as the penultimate joint, and is fuscous for its upper half, ferruginous with a white base for its lower, *i. e.* from the last quarter of the

basitarsus on ; anterior coxal spines well developed ; spines at apex of abdomen long and straight, without any inner pair ; the short sublateral spines are black.

Hab. Same locality and date as *G. Wellmani* ; taken by Dr. Wellman at flowers of *Compositæ*, one of each sex.

Megachile caricina, sp. n.

♀.—Length about $10\frac{1}{2}$ mm.

Black, with broad head and broad shovel-shaped abdomen ; hair of face pale yellowish, of cheeks white, of occiput pale, but about ocelli short and black ; antennæ entirely black ; mandibles 4-dentate ; clypeus normal, strongly punctured, with a smooth, shining, discal area ; hair of thorax white at sides and beneath, above black, with some whitish on mesothorax in front and in mesothoracico-scutellar suture ; mesothorax and scutellum very densely punctured ; tegulæ black. Wings strongly dusky. Hair of legs white, pale reddish on inner side of tarsi ; hind basitarsus very broad and flat ; claws simple ; abdomen punctured, not strongly or closely, and without bands ; apical segments above with coarse black bristles ; scopa bright orange-red, but white basally and black on last segment.

♂.—Size about the same, as also general appearance.

Face densely covered with yellowish-white hair, a few dark hairs on each side near upper part of clypeus ; black hairs on vertex ; antennæ black ; anterior tarsi quite simple ; anterior coxæ with rather short but stout spines ; metathorax and first abdominal segment with copious white hair ; apex with a strong transverse keel, which is broadly emarginate but not serrate ; no subapical ventral teeth ; claws bifid at end.

This belongs to *Megachile*, s. str., as defined by Friese and Robertson. In its general appearance it is much like the American *M. mendica*, Cresson.

Hab. Same locality and date as *Gronoceras Wellmani* ; 2 ♂, 1 ♀, taken by Dr. Wellman, the males marked "on flowering sedges, side of stream," the female "on sedges."

XIII.—*Notes on the Habits and External Characters of the Solenodon of San Domingo (Solenodon paradoxus).* By A. HYATT VERRILL*.

[Plate IV.]

ALTHOUGH *Solenodon paradoxus* of San Domingo and Haiti was discovered and imperfectly described as early as 1839,

* Reprinted from the Amer. Journ. Sci. for June 1907. From an advance proof communicated by the Author.

several years before the Cuban species (*Solenodon cubanus*) was known to science, it is still practically unknown to recent zoologists. The published descriptions of this rare and interesting mammal are vague and unsatisfactory. For many years it has been commonly considered extinct, and when, in December 1906, I undertook a collecting-trip to San Domingo with the avowed intention of obtaining the *Solenodon*, prominent zoologists stated that the quest was hopeless, one of them saying that I would be as likely to secure specimens of ghosts as of *Solenodon paradoxus*.

During the five months spent on the island I devoted a great deal of time hunting for the *Solenodon* and in interviewing natives from the remote and little-known parts of the island.

I soon found that the animal was well known to the natives in certain isolated localities, but that over the greater portion of the Republic it was absolutely unknown.

This is readily accounted for by the presence of the mongoose in most parts of the country, and it is only a question of time when this pest will overrun the entire island and the *Solenodon* will become actually exterminated.

The natives have several names for the *Solenodon*, calling it "Orso," "Milqui," "Homigero," and "Juron," while the English-speaking negroes from the British West Indies know it as "Ground Hog." The name "Juron" (ferret) is also applied to the mongoose, and for some time I was misled by this confusion of the two animals. In its habits the *Solenodon* resembles a hog, rooting in the earth and cultivated grounds, tearing rotten logs and trees to pieces with its powerful front claws, and feeding on ants, grubs, insects, vegetables, reptiles, and fruit, and at times proving destructive to poultry. On several occasions it has been known to enter the houses in search of roaches and other vermin, and has been captured in rat-traps.

It is strictly nocturnal, and spends the day in caves, holes in the coral-limestone rocks and in hollow trees and logs. It is a slow, stupid creature. It is unable to run rapidly, but shambling along with the zigzag sidewise motions of a plantigrade. It is doubtless owing to this that it obtained the native name of "Orso" (bear).

Its long snout and stout front feet, with their curved claws, and its thick short neck prove impediments to forward progress. According to the natives, it is incapable of running straight. They also claim that when pursued it frequently trips itself and tumbles heels over head. When hunted with dogs, it thrusts its head into the nearest hole or shelter, and allows itself to be captured without resistance.

The only specimen that I obtained was a female, which was captured alive and uninjured. A few days after its capture it gave birth to three naked young. These the mother promptly devoured, and she died three days later.

This specimen (see Pl. IV.), as preserved in formol, is 14 inches in length, exclusive of the tail, which measures about 13 inches in length.

The body and head are covered with sparse coarse hair, which is reddish ferruginous from the eyes to the shoulders and dusky brown on the rest of the body.

The hair becomes very thin and scattered on the hind-quarters, which for some distance on the back and sides are naked, roughly corrugated, and warty, with a sparse, short, woolly growth between the excrescences.

The legs, snout, and eyelids are naked, and, with the bare skin of the rump, are pinkish white. The ears are short, thin, rounded, and are bluish grey with light edges. The heavy rat-like tail is dark brown and naked. The claws are horn-colour. The front feet and claws are large, heavy, and mole-like, and well adapted to digging and tearing asunder rotten wood &c. They are much smaller in proportion than in the Cuban species, however. The snout is also more flexible than in *S. cubanus*, from which it also differs in the naked skin of the rump, the colour, size, and other characters.

XIV.—On Three new Mammals from British New Guinea.

By OLDFIELD THOMAS.

IN a further consignment of small mammals presented to the National Museum by Mr. C. A. W. Monckton, Resident in Northern British Guinea, there are examples of the two following new Rodents, one of them forming a new and most striking genus allied to *Hydromys*, but even more highly specialized for an aquatic life.

The collection also contains specimens referable to *Macroglossus australis*, *Pseudochirus corinnæ* and *Forbesi*, and *Phalanger carmelitæ*, all being valuable acquisitions to the Museum.

In determining the last-named animal, a new *Phalanger* allied to it has been noticed and is now described. It was obtained by Mr. A. Meek.

CROSSOMYS, gen. nov. (Hydromyinae).

A highly specialized aquatic form. Fur thick, soft, and

very woolly. Ear-conches practically aborted, a mere rudiment, 1-2 mm. in length, being all that is left of them. Whiskers not so thick or long as in the allied forms. Fingers free, toes rather more broadly webbed than in *Hydromys*; claws, both fore and hind, small, delicate, strongly curved; hind feet broad, more twisted than in *Hydromys*, those of *Parahydromys** being less so; sole-pads broad and smooth, a large part of the elongate hallucal pad visible in an upper view of the foot. Tail provided with a strongly marked swimming-fringe below, formed of hairs about 8 mm. in length, the fringe bifurcating into two lateral ridges on the proximal inch of the short-haired part of the tail.

Skull with a proportionally short slender face and very large, smoothly rounded, broad and low brain-case. The distance from the supraorbital foramina to the occiput is therefore greater instead of less than that to the tip of the muzzle. Nasal and interorbital region slightly built, not broadly swollen as in *Parahydromys*. Cranial ridges practically absent. Interparietal sutures almost obsolete in the type, which is an old specimen. Structure of ante-orbital and palatal foramina as in *Hydromys*, the latter not so far forward as in *Parahydromys*. Bullæ very small, in correlation with the abortion of the external ear-conches.

Dentition as in *Hydromys*. Upper incisors narrow, considerably bevelled laterally. Molars small in proportion to the size of the animal; in structure like those of *Hydromys* except that the laminae are more directly transverse and the middle lamina of m^1 is scarcely broadened internally.

Type *Crossomys Moncktoni*.

This beautiful animal forms a most striking new genus, and Mr. Monckton is to be congratulated on its discovery. In specialization for an aquatic life it far surpasses *Hydromys*, as indicated by its woolly fur, aborted ear-conches, twisted hind feet, and fringed tail, in which last character it resembles the European water-shrew (*Neomys*, long known as *Crossopus*). Indeed in the accumulation of these characters it stands at the head of all rodents, for while *Fiber* has an even more specialized tail and the same fur and feet, it has retained its ear-conches. Perhaps the nearest analogue to

* Described as *Limnomys*, Ann. & Mag. N. H. (7) xvii. p. 325 (1906). This name being preoccupied (Mearns, 1905) the genus was given (Zool. Anz. xxx. p. 326, 1906) the clumsy name of *Parahydromys* by Poche, to whom a perusal of page 14 line 10 of the Stricklandian Code of Nomenclature (1863) is to be recommended. My own substituted name of *Drosomys* (P. Biol. Soc. Wash. xix. p. 199, 1906) was a few months later in date.

Crossomys, both in structure and habits, is *Anotomys*, from the torrents of the high Andes, which has altogether lost its ear-conches, has equally aquatic fur and feet, but in which the tail, although longer-haired below, has not such a specialized swimming-fringe.

The structural modifications of the Beaver are of so different a nature as hardly to come into the comparison.

Crossomys Moncktoni, sp. n.

Size considerably less than in *Hydromys*. Fur soft and glossy, the comparatively sparse longer fur of the back about 18 mm. in length, the wool-fur very thick, soft, and close, about 10–11 mm. in length, resembling that of *Fiber*.

General colour above grey (grey no. 6), washed on the back with pale yellowish olivaceous, the longer hairs with black tips and isabella subterminal rings; the wool-hairs silvery white or greyish white for seven-eighths their length, their tips black. Under surface silvery white, the line of demarcation well-marked, high up on the sides, the hairs white to their bases or very faintly greyer below the tips. A narrow line down front side of arms like back, the remainder white; upper surface of hands pale brown, the fingers naked. Feet practically naked, the few minute hairs glossy white. Tail grey throughout on the short-haired part, the swimming-fringe white.

Skull and teeth as described above.

Dimensions of the type (measured in the skin):—

Head and body 205 mm.; tail 220; hind foot (wet) 48.

Skull: greatest length 40·5; basilar length 31·5; zygomatic breadth 22·2; nasals 11·4 × 5; interorbital breadth 5·8; breadth of brain-case 19·7; height of brain-case from basion 12; palatilar length 17·3; diastema 10·8; palatine foramina 5; length of upper tooth-row 5·3, of m^1 4·2.

Hab. Serigina, Brown River, N.E. British New Guinea. Altitude "not less than 4500 ft."

Type. Adult female. B.M. no. 7. 5. 22. 3. Original number 36. Collected 12th October, 1906, and presented by C. A. W. Monckton, Esq.

"Iris dark brown. Caught while swimming down a rapid creek."—C. A. W. M.

Uromys anak, sp. n.

A very large species with a wholly black tail.

Size largest of the genus. Fur harsh; longer hairs of back 28–31 mm. in length, underfur about 20 mm. General

colour coarsely mixed grey-brown, becoming bistre on the middle back and rufous or burnt-umber on the rump. When first appearing the hairs of the fore-back at least are really grey, that is ringed with black and white, but owing to the bleaching of the black to brown, and of the white to buffy white, the general tone soon approaches bistre. Under surface mixed brown and whitish, without sharp line of demarcation, most of the hairs brown with whitish tips, but a certain number along the median area white to their bases. Muzzle and chin dark brown. Ears short, naked. Arms grizzled brown, like body, the inner aspect rather lighter; upper surface of hands reddish brown. Hind legs dark rufous, becoming browner on the metatarsals; toes naked, except for the few brown hairs at the roots of the claws. Tail long, of the usual *Uromys* structure, wholly black, except for the short basal furry portion, which is deep reddish.

Skull large and heavy, but otherwise as in the other members of this group. The molar series markedly longer than in any other species.

Dimensions of the type (measured on the skin):—

Head and body 310 mm.; tail 400; hind foot (wet) 69; ear (wet) 24.

Skull: palatilar length 38.5; nasals 27×8.6 ; interorbital breadth 10.3; diastema 23.5; palatine foramina 7.3; upper molar series (crowns) 14.2.

Hab. Ifogi, Brown River, N.E. British New Guinea. Altitude "not less than 4000 ft."

Type. Old male. B.M. no. 7.5.22.2. Original number 27. Collected 2nd October, 1906, and presented by C. A. W. Monckton, Esq.

"Iris dark brown. Native name 'Felek.' A ground animal, living in burrows, though occasionally found in the hollow of a leaning tree."—C. A. W. M.

Under the names of *Uromys validus**, *Hapalotis papuanus*†, and *Mus barbatus*‡, three members of this group of the genus have been described from South-eastern New Guinea, though it is possible that all of these names, or either two of them, may be synonymous with each other. I have examined the types of the first and third, and find that their upper molar series measure 11.3 and 11 mm. respectively, and each of these has the terminal portion of the tail yellow.

The case of "*Hapalotis papuanus*" is not so clear, for nothing

* Peters & Doria, Ann. Mus. Genov. xvi. p. 703 (1881).

† Ramsay, P. Linn. Soc. N.S.W. viii. p. 18 (1883).

‡ Milne-Edwards, Bull. Mus. Paris, 1900, p. 167.

is said as to the colour of the tail, and the skull and tooth-measurements are quite inconsistent with each other. However, both upper and lower tooth-series are said to be "0.49 in." (=12.5 mm.), and if this be taken as correct the size of the animal would be little larger than in *U. validus*, and considerably smaller than in *U. anak*.

Phalanger sericeus, sp. n.

A dark brown species like *Ph. carmelitæ*, the fur very long and silky.

Size and general characters as in *Ph. carmelitæ*, to which the specimen had been hitherto referred. Fur very much longer than in that species (hairs of back about 38 mm. in length instead of 27 or 28), exceedingly soft and silky, quite unlike the rather coarse close fur of the allied species. Colour essentially as in *carmelitæ*, chocolate-brown above and pure sharply defined white below, but the brown above is darker and more glossy, resulting from the comparative silkiness of the hairs. The median dorsal area blacker than the sides, but no defined stripe perceptible. A patch of paler brown just above the base of the tail. Ears very small, thickly clothed internally as well as externally with short brown hairs. Tail with the proportions of the hairy and naked portions about as in *Ph. carmelitæ*, but the proximal part of the latter is smoother and less shagreened.

Skull and teeth very much as in *Ph. carmelitæ*, except that the secators, both above and below, are less developed, their apical ridge, which has three or four distinct crenulations in *carmelitæ*, reduced above to an indistinctly bifid point, and below to an undivided one. Molars rather narrower than in *carmelitæ*. Coronoid process of lower jaw rather higher and less slanted backwards than in the allied species.

Dimensions of the type (measured in skin):—

Head and body 455 mm.; tail 310; naked part of tail above 170; hind foot (s. u.) 57.

Skull: basal length 75; greatest breadth 51; greatest diameter of upper secator 4.3; combined length of three anterior molariform teeth 16.5.

Hab. Owgarra, Angabunga River (near the Aroa River), S.E. New Guinea. Altitude 6000'.

Type. Adult male. B.M. no. 5. 11. 28. 23. Collected 30th October, 1904, by Mr. A. Meek. One specimen.

This *Phalanger* was placed on arrival with *Ph. carmelitæ*, but the further material since received from Messrs. Monckton and Meek shows the Angabunga specimen to represent quite a distinct form.

XV.—*New and little-known Eastern Moths.*
By Colonel C. SWINHOE, M.A., F.L.S., &c.

Family **Eupterotidæ**.

Apona khasiana, nov.

♂ ♀. Of a uniform pale ochreous-brown colour, darker and more ochreous than in *A. pallida*, Walker, from Sikkim, but about the same size; the plumes of the antennæ about half the length and brown in colour; the transverse lines and bands similarly placed, the medial and discal lines single, the latter curving inwards in its middle; a black dot at the end of the cell of fore wings; the underside of both wings with some large red-brown patches towards the outer margin.

Expanse of wings, ♂ $3\frac{3}{10}$, ♀ $4\frac{2}{10}$ inches.

Khasia Hills.

This is probably the insect referred to by Mr. Elwes as *Apona cashmirensis*, Kollar, expanse 120 mm., from the Khasis, in Journ. Bo. N. H. Soc. xi. p. 250 (1897); but *cashmirensis* is a small insect differing from both *pallida* and *khasiana* in the shape of its bands. I have it from Solon, taken by Bayne Reed.

Family **Arctiidæ**.

Diacrisia procedra, nov.

♂. Above and below of a uniform pale ochreous-buff colour; antennæ and palpi black, frons with black sides: fore wings with two black costal spots, one before and the other beyond the middle; a black spot at the upper end of the cell, another close to hinder margin below the first spot, a spot at the base, the discal band of spots below showing through the wing with two spots on it on the hinder margin above, and two dots on veins 2 and 3: hind wings with a large spot at the end of the cell and a discal band composed of two very large black spots joined together, each divided by veins 1 and 2, and a small spot divided by vein 5; cilia concolorous, without markings; abdomen pinkish, dorsal and lateral rows of small black spots. Underside marked as above, except for a larger black spot at the end of the cell of fore wings, and the discal band clear and prominent, composed of three large spots divided by the veins and connected with each other by small black dots; pectus bright ochreous, with black hairs; legs with black stripes.

Expanse of wings $1\frac{5}{10}$ inch.

Padang, Sumatra; one example.

Superficially resembles *D. punctata*, Moore, which I have from Java.

Diacrisia amilada, nov.*

♂. Palpi and frons black; antennæ greyish white; head, thorax, and fore wings brownish buff, spots and bands on the latter black; a basal spot, a spot near the hinder margin at the middle, another above it, and then in continuation five small spots in a line obliquely inwards to the costa; three bands of paired linear marks divided by the veins, the first from the hinder margin a little beyond the middle obliquely to the costa a little before the apex, the second running almost parallel, starting a little before the hinder angle, the third close to the outer margin, the second spot of the row being absent: hind wings pale pink, a large black spot at the end of the cell and a discal band composed of two large black spots in the lower disk and two in the upper; cilia of both wings ochreous grey, with black spots on the upper third; abdomen pale pink, with dorsal and lateral rows of black spots. Underside: wings paler, hind wings nearly white, markings much as above, except for a large black lunular spot at the end of the cell of the fore wings; fore legs scarlet, hind legs grey, all with blackish stripes.

Expanse of wings $1\frac{8}{10}$ inch.

Padang, Sumatra; one example.

Chionæma rhadota, nov.

♀. Palpi and antennæ dark orange-colour; frons white, with an orange spot; head and thorax white, bands on each side of the thorax scarlet: fore wings white, bands scarlet; a subbasal, rather thin, sinuous band not reaching the hinder margin; a broad antemedial band slightly bent inwards in the middle, with a thick black line on its inner side; a large black spot at the end of the cell; a postmedial erect band as broad as the other, with a thick black line on its outer side which slightly curves inwards above its middle; a marginal scarlet band of somewhat lesser width: abdomen and hind wings pinkish ochreous without markings; cilia of both wings yellow.

* This I expect is the insect identified by Piepers and Snellen in their list of Javan Lepidoptera as *D. casigneta*, Kollar, a Palearctic species not unlike it in general appearance, but quite a different insect with black antennæ.

Expanse of wings $1\frac{3}{10}$ inch.

Sitoli, Nias; one example.

There is a female from Nias in the B. M. with *C. javanica*, Butler. I have no doubt when the male is known it will be found to be quite different to the male of the Javan species.

Family Drepanulidæ.

Drepana albiceris, nov.

♀. Whitish buff-colour; palpi black; antennæ orange-brown; a black band on the upper half of the frons; legs brown above; thorax and abdomen without markings: wings sparsely covered with very minute orange-brown atoms and a few larger black atoms; a transverse brown band composed of three lines close together from near apex of fore wings, where there is a small brown patch with a pale centre, to the middle of the abdominal margin of the hind wings; on the hind wings the band is accompanied by some slight blackish suffusion, and is obsolete above vein 6, and at the end of cell touching the inner margin of the band is a rather prominent black spot; on both wings there are submarginal black dots, close to the margin at the apex of fore wings, widening from the margin hindwards: on the underside the band is blackish brown, broad and complete, and there is a similar band on the outer margin.

Expanse of wings $2\frac{4}{10}$ inches.

Padang, Sumatra; one example.

In shape this species is like *Drepana curvaria*, Walker, from Mysol, figured in Cat. Het. Mus. Oxon. i. pl. vii. fig. 1, but it is larger and the fore wings more falcate.

Family Lymantriidæ.

Leucoma ecnomoda, nov.

♂. Palpi bright pinkish orange; head dark chestnut-colour; front of thorax pure white, remainder of thorax, abdomen, antennæ, and wings rather pale pinkish brown: both wings with a large irregular hyaline patch, evenly curved on its inner side at one third from the base, running to a point below the costa, very irregular on its outer side, with three square lobes projecting outwardly on the fore wings and one on the hind wings and occupying the best part of the wings; on the fore wings above and close to the hyaline patch there is a duplex hyaline spot, almost subapical; on the hind wings there is one, with another disconnected patch outside. On the underside the coloration is pinkish white.

Expanse of wings $1\frac{2}{10}$ inch.

1 ♂, Buitenzorg, Java (type).

1 ♂, Padang, Sumatra.

Allied to *Leucoma fenestrata*, Hmps., from Ceylon, the hyaline patches much larger and differently shaped.

Euproctis xanthura, nov.

♂. Antennæ and frons dull ochreous; palpi brown above, white beneath and at the tips; body and wings blackish brown; thorax orange in front; abdomen with an ochreous tuft: fore wings with the costal line and a patch at the apex ochreous white, a prominent black spot at the apex, a little ochreous white on the outer margin below the middle, and the broad cilia ochreous white: hind wings without markings, the cilia pure white. On the underside the inner portion of the fore wings is pale blackish brown, the base and margins broadly whitish; the hind wings are all white except for some blackish-brown suffusion on the abdominal third; abdomen blackish brown, thorax and legs whitish.

Expanse of wings $1\frac{1}{10}$ inch.

Padang, Sumatra; one example.

Belongs to the *scintillans* group, but is not very closely allied to any of the forms of that section.

Euproctis neola, nov.

♀. Of a uniform blackish brown; antennæ, palpi, thorax beneath, legs, and abdominal tuft pale whitish ochreous; thorax in front dull orange: fore wings with a large apical bright yellow patch, containing two prominent black spots, one at the apex and the other below it; another yellow smaller patch in the shape of a half-circle on the outer border below the middle; cilia concolorous with the two colours of the wing: hind wings without markings, the cilia bright yellow, with a little of this colour entering within the outer margin. On the underside the fore wing is the same as it is above, except that the apical spots are absent and the costal line is yellow; on the hind wings there is a marginal yellow band and yellow cilia.

Expanse of wings $1\frac{1}{2}$ inch.

Padang, Sumatra; one example.

Family Chalcosiidæ.

Soritia zebra.

Laurion zebra, Butler, Ann. & Mag. Nat. Hist. (5) xiv. p. 85 (1884).

Erasmia laja, Pag. Nass. Ver. xxxviii. p. 11, pl. i. fig. 5 (1885).

Sitoli, Nias.

Butler's and Pagenstecker's types were females. I have received both sexes from Sitoli. The male differs from the female in having a narrow discal white band on the fore wings, narrower than in the male of *Soritia obliquaria*, Fabr., but it is broken into three pieces, the centre piece being a small white spot; the black marginal band of the hind wings is narrower, and the black portions of both wings on the undersides are covered with blue streaks and spots as in the female.

Family Notodontidæ.

Stauropus virescens.

Stauropus virescens, Moore, P. Z. S. 1879, p. 404; Hmps. Journ. Bo. N. H. Soc. xiii. p. 42 (1900).

Sikkim.

Moore's type is a male; I have lately received from Sikkim what I believe to be the female. The fore wings have the same kind of green above, with four irregular, dark, transverse bands; the hind wings are pale brownish grey and the undersides of both wings are grey and quite unmarked as in the male; the fore wings are rather broad and the expanse $2\frac{3}{10}$ inches.

Family Hadenidæ.

Polia illoba.

Agrotis illoba, Butler, Ann. & Mag. Nat. Hist. (5) i. p. 162 (1878).

Polia illoba, Hmps. Phal. v. p. 151 (1905).

Graphiphora pacifica, Butler, l. c. p. 165.

Mamestra declinans, Staud. Stett. ent. Zeit. 1888, p. 250.

Khasia Hills; several examples.

Recorded from Siberia, Japan, and China; not previously recorded from the Indian Region.

Family Focillidæ.

Iluza eugrapha, nov.

♂ ♀. Of a uniform grey colour, very slightly tinged with pinkish ochreous and minutely irrorated with black atoms; antennæ blackish brown; sides of the palpi and legs black; fore wings with a black dot in the middle of the cell and another at the end; a broad straight band from apex of fore wings to near anal angle of hind wings, obsolete from vein 6 to the costa; this band is composed of a thick black outer line, a thin black inner line, the narrow space between them grey-pink, and close to it on the inner side on both wings is

another fine black line for two thirds upwards ; there is also a black spot just below the middle and close to the outer side of the band on the fore wings ; a thin marginal interrupted line and black points close to the outer margin on both wings ; a black dot at the end of the cell on the hind wings. Under-side paler, no markings ; the cell-dots and a complete festooned black line on the outer margin of both wings, most prominent in the female.

Expanse of wings, ♂ $1\frac{4}{10}$, ♀ $1\frac{7}{10}$ inch.

♂, Gédé, W. Java.

♀, Padang, Sumatra.

Allied to *Iluza transversa*, Moore, from Sikkim and Assam. There is a male from Bali in the B. M. unnamed, Quadrifid drawer no. 222.

Family Boarmiidae.

Ophthalmodes plesia, nov.

♂. Moss-green ; palpi and frons ochreous white, palpi at the sides, head, and antennæ black : wings somewhat pale between the bands, making them more or less variegated in colour, with four transverse, duplex, green, slightly dentated bands at equal distances apart, commencing from black spots on the costa of the fore wings and with black spots throughout on each inner band, the outer margin of both wings with equally prominent black spots ; cilia white, a black spot at the end of each cell. Underside whitish, suffused with dull pale green ; a black spot at the end of each cell and a dull blackish submarginal band more or less macular.

Expanse of wings $1\frac{7}{10}$ inch.

Padang, Sumatra ; one example.

BIBLIOGRAPHICAL NOTICE.

Books and Portraits illustrating the History of Plant Classification.

London : Printed by Order of the Trustees of the British Museum, 1906.

IN this small pamphlet, which has been drawn up by Dr. A. B. Rendle, to accompany a collection of books and portraits exhibited in the Botanical Gallery of the Natural History Museum at South Kensington, there will be found a great deal of information which will be highly appreciated by all who are interested in the history of botany.

Herein will be found short biographies of some of the most eminent botanists, as well as a brief outline of their work.

In addition to the text, portraits are included of Ray, Linnæus, and Robert Brown, as well as a copy of "Ehret's plate illustrating the 24 classes of the Sexual system." And the whole can be bought for fourpence !

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 116. AUGUST 1907.

XVI.—*A Contribution to the Knowledge of the Hymenoptera of the Oriental Zoological Region.* By P. CAMERON.

[Concluded from p. 30.]

ICHNEUMONINÆ (continued).

Chiaglas nigripes, Cam.

Chiaglas nigripes, Cam. Ann. & Mag. Nat. Hist. (7) ix. p. 152.

Runjit Valley, Sikkim, 1000 feet; April (*C. T. Bingham*).
Described from the Khasias.

In *Chiaglas* the discocubital nervure is broken by a stump and the transverse median nervure is received shortly beyond the transverse basal. The species mimics a *Myermo*, it having the same size and colour-markings as, *e. g.*, the common *M. maculitarsis*, Cam.

Haliphera latibalteata, sp. n.

Black; the face, clypeus, base of mandibles, a line on the inner orbits, above extending to near the hind ocelli, the lower half of the outer orbits, malar space, prothorax (except for a line in the centre of the pleuræ dilated at the base), a large mark in the centre of the mesonotum (trilobate at the base, roundly incised at the apex), scutellums, a broad mark down the middle of the metanotum (half in the upper, half in the lower part, of equal width) rounded above, transverse

Ann. & Mag. N. Hist. Ser. 7. Vol. xx.

below, tubercles, a large mark on the lower half of the mesopleuræ (rounded below and extending on to the sternum, rounded and narrowed above at the apex), an oval spot below the hind wings, a large mark in the middle of the metapleuræ (transverse at the base, the three other sides broadly rounded), the postpetiole, almost the apical half of the second segment, two broad marks (obliquely narrowed towards the base) on the apical half of the third, two smaller oblique triangular marks on the sides of the fourth, a narrow line on the apex of the fifth and sixth, and the seventh from shortly behind the middle, bright orange-yellow, as are also the legs (except the fore femora behind, the middle at the base all round and at the apex, slightly more broadly above, the middle yellow part being about as long as the black apical); the basal and apical third of the posterior all round, the base narrowly of the four hind tibiæ (their apices more broadly), the four anterior tarsi above, and the hind coxæ and trochanters, black. The underside of the antennal scape yellow, the sixth to fourteenth joints of the flagellum white. Wings hyaline, the nervures and stigma black. ♂.

Length 14 mm.

Runjit Valley, Sikkim, 1000 feet; April (*C. T. Bingham*).

Head closely punctured, the apex of clypeus and a large round depression over each antenna smooth, shining. Thorax closely punctured, the depression in the centre of propleuræ obliquely irregularly striated; the apex of the mesopleuræ finely, closely, obliquely striated below. Median segment closely rugosely punctured, the apex of the posterior median area transversely striated; the lateral apical area more strongly, irregularly, and much less closely striated; the apex of the pleuræ irregularly, stoutly, obliquely reticulated. Postpetiole smooth, the second and third segments closely punctured. Gastrocoeli longer than wide, somewhat pyriform, smooth on the inner side at the base, the outer side coarsely aciculated. Tarsi closely spinose. The areolet 5-angled, large, the recurrent nervure received shortly beyond the middle.

For a synopsis of the Indian species of *Haliphera* see 'The Entomologist,' 1904, p. 307. *Inter alia*, the present species may be known by the broad continuous band on the second abdominal segment.

DIPLOPTERA.

Odynerus Hewittii, sp. n.

Black; the mandibles (except at extreme apex), clypeus,

the eye-incision entirely, a line down the centre of the front (narrowed on the upper half, dilated below the middle, and the apex still more widely triangularly dilated), the outer orbits almost entirely, a triangular mark between the ocelli and the eyes, a large pyriform mark on the sides of the pronotum, the two united by a narrow line, two longish lines down the centre of the mesonotum, a mark on the basal half of the scutellum (roundly incised in the middle), a large mark on postscutellum (its base transverse, the apex obliquely narrowed), a large curved triangular mark covering the sides of the metanotum, the narrowed part below, two large marks on the mesopleuræ at the base (the upper broader and shorter than the lower, the two divided by the suture), tegulæ (except for a fuscous spot), the first abdominal segment at the top of apical slope, its apex and the apices of the following seven segments, the lines dilated laterally and that on the seventh also in the middle, a mark in the centre of the eighth (narrowed towards the apex), the sides of the second ventral broadly, its apex more narrowly (the black central mark formed thereby is obliquely narrowed at the apex), and the apices of the other segments, yellow. Legs yellow, the coxæ, trochanters, and femora black behind. Wings hyaline, the anterior suffused with fuscous; the stigma fuscous, the nervures black. ♂.

Length 10 mm.

Kuching, Borneo; June (*John Hewitt*).

Clypeus as broad as long, the apical half roundly narrowed, the apex transverse. Upper part of head and the thorax, except the apex of the mesopleuræ and the base of metapleuræ (which are bare, smooth, and shining), closely, rather strongly punctured. Underside of antennal scape yellow, of the flagellum brown, as is also the hook, which is as long as the joint. Base of thorax not quite transverse, the sides of metanotum margined; the postscutellum is obliquely narrowed. The pubescence all over is short, dense, and pale.

In the Journ. Linn. Soc. 1857, p. 112, Mr. F. Smith described an *Odynerus multipictus* from Borneo; in the same journal, 1859, p. 165, he described another *O. multipictus* from Aru. In his 'Catalogue of Malay Hymenoptera' the Aru *multipictus* is duly noted, but not the earlier one. Saussure (Stett. ent. Zeit. xxiii. p. 200) redescrives what he regarded as the Borneo *multipictus*, and renamed it *guttulatus*—"parce que l'auteur l'a aussi donné à une autre espèce qui pourra le conserver." It is, however, the Aru *multipictus* of 1859 that ought to have been renamed. Bingham ('Fauna of Brit. India,' Hymen. i. p. 368) describes and figures the

Borneo *multipictus*, but only the female. Col. Bingham has given me from Sikkim the male of what is no doubt the Indian *multipictus* (*l. c.* pl. ii. fig. 13). I have unfortunately only males of these yellow-banded species. Those known to me may be separated as follows:—

- a.* The pubescence dense and black, the apex of the clypeus not transverse; pygidium black; the lateral marks on metanotum not much widened above.
 Pronotum and tegulæ black; pleuræ and scutellum immaculate; second ventral segment black, with two large yellow spots, the other segments black *multipictus*, Sm.
 Pronotum, pleuræ, and scutellums marked with yellow; the ventral segments (except the apical two) for the greater part yellow. . . . *septemfasciatus*, Sm.
- b.* The pubescence short and pale; the apex of clypeus transverse; pygidium with a large yellow mark; the marks on metanotum much widened above *Hewittii*, sp. n.

Odynerus heterospilus, sp. n.

Black; the clypeus, the eye-incisions, a longish triangular mark over the antennæ, the greater part of the mandibles, an oblique mark opposite the ocelli touching the eyes, the outer orbits broadly, the base of pronotum, apex of tegulæ, the base of scutellum to near the middle, a broad curved line (widened above) on the sides of metanotum, a large conical mark (longer than wide) below the tegulæ, a smaller narrower spot near the apex of mesopleuræ below, the first abdominal segment (except narrowly at the base), the apices of the second to fifth, the whole of the sixth, the base of the second ventral, and the apices of the middle ventral narrowly, yellow, the yellow on the abdomen tinged with rufous; a transverse line on the vertex behind the ocelli, the apex of pronotum from shortly behind the middle, the sides of mesonotum largely, and a spot below the hind wings surrounding a yellow mark, blood-red. Underside of antennal scape yellow, of flagellum brown. Legs yellow, the four anterior coxæ, trochanters and femora behind, and the greater part of the posterior, black. Wings clear hyaline, the radial cellule smoky, the stigma testaceous, the nervures black; the first and second transverse cubital nervures united in front. ♀.

Total length 9 mm.

Kuching, Borneo; February (*Hewitt*).

Belongs to *Odynerus* (*sensu str.*). Densely covered with short white pubescence. First abdominal segment large,

cup-shaped, not quite sessile, slightly longer than it is wide at the apex; the second longer than wide, the apex with a narrow but distinct depression. Clypeus with the apex transverse, as it is also above. Apex of postscutellum transverse; the sides of metanotum bluntly rounded, the apex transverse, not much depressed in the middle. The base of the thorax is not quite transverse and with the sides rounded.

A distinct species.

Ancistrocerus megaspilus, sp. n.

Black; clypeus, mandibles (except the inner edge), the eye-incision, the yellow extending beyond it, a longitudinal line (extending from shortly above the top of the eye-incision to the antennæ, its top narrowed, the bottom dilated), a short oblique line on the vertex running into the top of the eyes, the outer orbits broadly, a broad line on the sides of pronotum (extending from the base to shortly beyond the middle), tegulæ, basal two thirds of scutellum, the apex of the mark transverse, the sides of the metanotum broadly, the mark curved and narrowed below, a large almost semicircular mark below the tegulæ, a much smaller oblique conical mark on the apex of mesopleuræ below, a small transverse mark on the sides of the first abdominal segment at the top of basal slope, a line on the apex of the first to fifth segments (that on the first dilated in the middle, the dilated part with an incision), and a large conical mark on the sides of the second segment, yellow. Legs yellow, black behind at the base. Wings hyaline, the radial and the apex of the costal cellule fuscous violaceous, the stigma dark fuscous; the recurrent nervure interstitial, the second cubital cellule much narrowed in front, but with the nervures apart. ♀.

Total length 10 mm.

Kuching; March (*Hewitt*).

Apex of clypeus transverse, moderately wide. Thorax more than twice longer than wide, the sides at the base broadly rounded, the apex transverse. Apex of postscutellum obliquely narrowed towards the centre. First abdominal segment cup-shaped, not quite sessile at the base; at the centre of its apex is a distinct fovea, there being similar foveæ on the second and third; the segments are smooth, silky. The base of the first abdominal segment is hardly separated from the rest, but is more glabrous and shining.

Sphegidæ.

Cerceris baluchistanensis, sp. n.

Yellow; a small longish spot over each antenna, the vertex

from the hinder ocelli (except for a triangular spot behind each of the latter), the basal two thirds of the pronotum and the central apical furrow, three broad lines on mesonotum and a similar one across the base, the space bordering the sides of scutellums, a large triangular mark covering the basal area of metanotum, a broad line covering the central apical furrow, and the space between the meso- and metapleuræ, black; the flagellum of antennæ and the space separating the abdominal segments rufo-fulvous. Legs yellow, the femora tinged with fulvous. Wings hyaline, the apex narrowly smoky, the costa and stigma fulvous, the apical nervures black. ♂.

Length 12 mm.

Quetta; June (*Nurse*).

Metanotal area closely but not very strongly transversely striated. Head, thorax, and, to a less extent, the abdomen covered with white pubescence, closely strongly punctured, the metathorax more closely than the rest. Clypeus fringed with pale golden hair, its apex bluntly rounded. Eyes slightly converging above. Hinder ocelli separated from each other by a little greater distance than they are from the eyes. Apical half of penultimate joint of antennæ abruptly narrowed, the last bluntly rounded at the apex. First abdominal segment slightly narrowed at the base, longer than it is wide at the apex. Pygidium strongly punctured throughout, of equal width, the apex bluntly rounded, keeled; the apex of epipygium bluntly rounded.

Comes near to *C. Walllii*, Spin., from Egypt.

Cerceris quettaensis, sp. n.

Black; the face, a broad line on the lower half of the inner eye-orbits, clypeus, mandibles (except the teeth), antennal scape, two marks (broader than long) obliquely widened towards the apex on the outer edge of pronotum, tegulæ, tubercles, postscutellum, basal half of second abdominal segment, the third entirely, the fourth narrowly in the centre, widely at the sides, the fifth (except for a curved black band on the base), the sixth entirely, and the greater part of the ventral segments, bright lemon-yellow, as are also the legs. Basal four joints of antennal flagellum dark yellow, the apical brownish below. Wings hyaline, the apex narrowly smoky, the stigma dark fuscous, the nervures black. ♂.

Length 11 mm.

Quetta (*Nurse*).

Metanotal area smooth, shining, the central furrow wide,

opaque, finely rugose. Entire body closely strongly punctured. Third antennal joint as long as the scape, shorter than the second and fourth united. First abdominal segment longish oval, about one half longer than wide, as long as the second. Abdominal segments strongly but not very closely punctured, the second smooth in the centre at the apex, the others smooth at the base, the last strongly punctured, depressed at the apex. Pygidium closely strongly punctured, slightly gradually narrowed towards the apex.

Comes near, apparently, to *C. eugenia*, Schlett.

Cerceris basimacula, sp. n.

Black; a mark on the centre of the clypeus (obliquely narrowed above and below), a broad line on its apex, a broad line on the inner orbits from the antennæ, two large oblique marks on the apex of the metanotum (extending on to the pleuræ), the basal third of the abdominal petiole on the sides, more than the basal third of the second segment, and narrow lines on the apices of the fourth and fifth segments, yellow; the sides of the central and lower parts of the clypeus, prothorax, scutellums, more than the apical third of the second and third abdominal segments, a line behind the yellow on the fourth and fifth, and the apical two segments entirely, dark rufous; the apex of the first segment of a paler rufous colour. Four front legs pale rufo-testaceous; the tibiæ and base of tarsi yellow; the hind legs similarly but much darker coloured. Wings hyaline, the radial cellule smoky, the apical cubital cellule of a deeper smoky colour; the costa and stigma dark testaceous, the nervures black. Antennæ rufo-testaceous, the scape yellow below, the eight apical joints blackish, paler below. ♂.

Length 10 mm.

Sikkim.

Face strongly but not closely punctured; the clypeus more finely and closely punctured; there is a short keel in the centre of the latter, with a fovea on either side. Front and vertex strongly, somewhat closely punctured. Middle of pronotum closely punctured, the sides almost smooth; mesonotum somewhat strongly but not closely punctured; the scutellum is more strongly but not so closely punctured as the latter. Postscutellum smooth. Metanotum strongly punctured, the punctures clearly separated; the area shining, smooth. Head and thorax densely covered with white pubescence. First abdominal segment of equal width, about four times as long as wide, longer than the second; the

segments strongly punctured; the pygidium strongly but not very closely punctured; the sides rounded, narrowed at the base and apex, the latter slightly rounded inwardly. The whole abdomen covered with longish white pubescence. Hypopygium depressed at the apex; the latter has a slight rounded incision.

Allied to *C. lepcha*, Cam.

Crabro violaceipennis, sp. n.

Black; the antennal scape, a narrow transverse line on the postscutellum, a spot (broad and rounded at the base, roundly narrowed towards the apex) on the base of the metanotum in the centre, a band (rounded at the apex, the base with two incisions in the middle, the space between projecting beyond them) on the apex of the first abdominal segment, a broad irregular band on the basal half of the second, a slightly narrower band (almost continuous) on the base of the third, and similar bands (but more clearly interrupted) on the base of the fourth and fifth, bright lemon-yellow. The legs black; the fore tibiae in front and above, the middle and posterior (except below and narrowly at the apex), the middle femora broadly below, and the basal joint of the tarsi (except at the apex), lemon-yellow. Wings fuscous violaceous, the nervures and stigma black. ♀.

Length 13 mm.

Sikkim.

Mesonotum and scutellum closely punctured, the latter more closely at the base than at the apex, where the punctures run into striæ. Postscutellum smooth at the base, the apex strongly but not closely punctured. Metanotal area closely longitudinally striated, the rest of the metanotum more strongly obliquely striated, the striæ curved and interlacing more or less. Face, clypeus, and cheeks densely covered with silvery pubescence; the thorax densely covered with white to silvery pubescence, which is longest on the metanotum. Pygidium shining, longish, the basal third with deep clearly separated punctures; the rest is less strongly and more sparsely punctured, especially in the middle. There is a deep crenulated furrow down the base of the mesopleuræ. Abdomen sessile, triangular.

Belongs to Bingham's section *B. c. b'*; with none of the species therein can it be confounded.

Crabro ctenopus, sp. n.

Black; a line above on basal half of mandibles, two broad

lines on pronotum, a large, irregular, oblique mark on the sides of second abdominal segment, a line (about three times longer than wide) on the sides of the third, a slightly longer and narrower one on the sides of the fourth, with two small lines between, a line on the basal half of the fifth, with two black lines in the centre at the base, a band on the centre of the sixth (with two rounded black lines, united at the base, in the centre), bright lemon-yellow. Anterior legs testaceous, the femora with the lower half yellow in front; the tarsi blackish towards the apex; the middle trochanters and femora clear lemon-yellow, with a broad black line in the middle and a short line on the apex below; the tibiae lemon-yellow, blackish at the base and apex, and with a broader blackish band in the centre; hind legs black, the metatarsus to near the middle pale yellow. Wings hyaline, iridescent, the costa and stigma black. ♂.

Length 9 mm.

Sikkim.

Abdominal petiole fully one fourth longer than it is wide at the apex; it becomes gradually widened from the base to the apex and is closely punctured. Base of metanotum with a small central area of equal width and a large area on either side (wider than long), the apical keel less distinct than the lateral and rounded; the top of the apical slope is irregularly widely reticulated, the middle smooth, the apex transversely striated. Top and apex of mesopleuræ above and at the apex smooth, the latter bounded by a rounded curved keel; the apex below with a narrow band of stout striae. Metapleuræ (except at the apex above) striated closely. The pubescence on the head, thorax, and sides of abdomen white, on the back of the abdomen bright golden fulvous. Basal joint of middle tarsi dilated, straight on inner side, rounded on outer to near the apex, which is narrowed, below it is fringed with a comb of stout bristles, the apex projects and ends in two long spines; the basal joint of the anterior broad, curved, slightly narrowed at the base, the following three joints are broad, the second as long as the following two united; the first joint of the posterior longer than the following united, broad, narrowed at the base. The middle of the mandibles rufous.

In having the metanotum areolated this species agrees with *C. agycus*, Cam., from the Himalayas ('The Entomologist,' 1904, p. 261).

Psen montanus, sp. n.

Black, shining, sparsely covered with short white pubes-

cence. Wings clear hyaline, the nervures and stigma black; the second cubital cellule much narrowed in front, one fourth of the length of the third in front; the first recurrent nervure received very shortly beyond the transverse cubital, the second at the apex of the basal fourth; metanotum without keels, except two indistinct longitudinal ones leading down to the furrow, which is distinct, smooth on upper, crenulated on lower half; the narrowed part of petiole half the length of thorax. Body smooth; the pubescence densest and longest on the sides. ♀.

Length 7 mm.

Simla (*Nurse*).

May be known from the other black Indian species by the absence of keels and areæ on the metanotum, it being also smaller than them. *P. kashmirensis*, *Nurse*, has a "remarkable tubercle" between the antennæ, and it agrees otherwise with the present species closely, but it differs in having a triangular depression at the base of the metanotum, which also bears outwardly diverging striæ, this not being the case with the present species.

Psen rufoannulatus, sp. n.

Black, shining, densely covered with longish white pubescence; the second and third abdominal segments bright red; the apical four joints of the tarsi rufo-testaceous; the wings clear hyaline, the stigma and nervures black; abdominal petiole as long as the thorax; the front with a distinct keel down the middle. ♀.

Length 9 mm.

Simla; August (*Nurse*).

A stout species.

Metanotal area bare, shining, large, clearly defined, the apex gradually roundly narrowed to a point shortly above the middle of the metanotum; in its centre are two parallel keels; at a distance from these is a keel; separated from it at the outer edge are three or four less distinct ones. The rest of the metanotum is opaque, irregularly striated, the striæ more or less curved; the pubescence is long and dense. The first recurrent nervure is received near the apex of the basal third of the cellule, the second very shortly beyond the second transverse cubital. Hind tibiæ with about a dozen white spines. The second abscissa of radius not quite half the length of third; the second cubital cellule wide in front.

Psen puncticeps, sp. n.

Black; the knees, tibiae, and tarsi whitish testaceous, the hinder darker tinted, with the tibiae fuscous from shortly beyond the middle; the second and following segments of the abdomen picceous, the narrowed part of petiole half the length of the thorax. Wings clear hyaline, the stigma dark fuscous, the nervures black. Metanotum without a basal area, the sides keeled, the keels with a narrow striated band on the inner side; the furrow on the apical slope is wider and deeper on the basal than on the apical part. Antennae stout, brownish below, the third joint about one fourth longer than the next, which is as long as the second. First recurrent nervure received close to the base of the cellule, the second at double the distance. Front closely, distinctly, the vertex less strongly punctured; there is a narrow keel down the centre of front, ending in a large stout projection between the antennae. Parapsidal furrows distinct on basal half of mesonotum; the furrow on the base of metanotum is deep, crenulated, it is separated in the middle by a smooth space bounded by curved keels. ♀.

Length 7 mm.

Simla.

Palarus fortistriolatus, sp. n.

Black, shining, sparsely covered with white pubescence; the three lobes of clypeus, lower half of front, basal third of mandibles, a broad line on the lower three fourths of the outer eye-orbits, the apex and the sides of pronotum to near the middle, a line on its base, a large mark in front of the tegulae roundly, irregularly narrowed at the base, tegulae, tubercles, a line on the base of mesopleurae, gradually narrowed below to a sharp point, not reaching to the breast, an irregular triangular spot on the outer lower side of its apex, scutellums, their lateral keels, and the greater part of the abdomen, bright lemon-yellow. Legs yellow, suffused with rufo-fulvous, the four hinder coxae and the greater part of trochanters black; the anterior metatarsus with seven long spines of equal length (except the basal, which is shorter), the apical two close together. Wings hyaline, the apex very slightly suffused with fuscous, the stigma and nervures fulvous, the apical nervures darker coloured. ♀.

Length 13 mm.

Quetta; June.

The basal slope of the first abdominal segment, the base

of the second to sixth narrowly, and the ventral (except for a line on the apex of the second and irregular marks on the sides of the others) black; the depressed apices of the first to fourth brownish; the line on the second broad, slightly dilated in the middle, that on the third forming a broad triangle, that on the fourth narrowly dilated backwards to the apex of basal third in the middle; there is a deep furrow in the centre of the apical two thirds of the fifth. The second ventral segment becomes gradually raised in the centre towards the apex (forming about one third of the segment), the apex of the raised part slightly roundly narrowed; the part beyond this is raised also, is stoutly striated, and has the apex bluntly rounded and curled up. Pygidium long, gradually roundly narrowed from the base to the apex, sparsely weakly punctured. Eyes at the top separated by not quite the length of the third antennal joint. Hinder ocelli irregularly oval, depressed in the centre, the depression behind them longer than wide, the apex deep, the base much shallower and narrowed; the anterior ocellus roundish, surrounded by a rounded furrow. Third antennal joint as long as the second and fourth united; front and face densely covered with silvery pubescence. Pronotum with a steep oblique slope from the top to the bottom, the top rounded, clearly separated, widened laterally. Base of mesonotum closely, the sides and apex sparsely punctured, the scutellums still more sparsely punctured. Metanotum depressed in the middle, strongly striated, transversely on base, obliquely on sides of apex, the centre being smooth; the rest closely, strongly, rugosely punctured, with an irregularly reticulated area, widest on outer side, on the inner side at the base. Pro- and mesopleuræ shining, sparsely punctured; the metapleuræ closely irregularly reticulated. The last ventral segment is flat at the base, gradually narrowed to a fine point, then prolonged into a keel; the penultimate flat. The front over the antennæ is roundly raised. Middle of first abdominal segment keeled laterally. The striation on the metanotum is irregular, being more transverse in one example than in the other; it is strong in both.

Allied to *P. flavipes*.

XVII.—*On a new Leptolepid Fish from the Weald Clay of Southwater, Sussex.* By A. SMITH WOODWARD, LL.D., F.R.S.

[Plate I.]

THIN cycloid scales which might have belonged to a *Leptolepis*-like fish have already been noticed in the English Wealden formation, but no complete example of a Wealden member of the Leptolepidæ has hitherto been described. A well-preserved specimen, however, which may be referred to the family just mentioned, has lately been found in the Weald Clay at Southwater, near Horsham; and I am indebted to the Directors of the Southwater Brick and Tile Co., Ltd. (through Mr. C. H. Aldersmith, A.M.I.C.E.), for the opportunity of studying this interesting fossil, which has now been presented to the British Museum.

The new specimen is preserved in counterpart in a slab of clay, and its best half is shown of one half nat. size in Pl. I. fig. 1. It is exhibited in direct side-view, only lacking the anterior part of the head and the hinder half of the caudal fin. The maximum depth of the trunk is contained somewhat less than three times in the length from the pectoral arch to the base of the caudal fin, and would probably equal about one fifth of the total length of the fish. The same depth is not quite three times as great as the depth of the caudal pedicle. The fragmentary remains of the head show that the mandibular suspensorium is inclined forwards, so that the articulation of the lower jaw must have been directly beneath the hinder part of the orbit. The hyo-mandibular bone (*hm.*) bears a long process for the suspension of the operculum (*op.*), which is shown in impression, trapezoidal in shape, and about as deep as broad. The preoperculum (*pop.*) has a long upright ascending limb, expanding below into a triangular plate. The suboperculum (*sop.*), best seen in the counterpart not figured, must have been about four times as broad as deep. Fifteen branchiostegal rays (*br.*) can be counted, the upper seven being expanded and in close series, the lower eight being narrower bars and more widely spaced. The opercular apparatus is quite smooth, not ornamented. The total number of vertebræ is about sixty, half being in the abdominal region. The centra are about as long as deep in the anterior part of the caudal region, but are somewhat shorter than deep both in the abdominal and

in the hinder part of the caudal region. They are well ossified and their primitive double-cone is strengthened by secondary bone arranged in fine, close, longitudinal ridges (fig. 2). The ribs are stout, apparently borne on very short transverse processes, and clearly extending to the ventral border of the fish. The fixed neural and hæmal arches in the caudal region are also very stout and gently arched. The hinder extremity of the vertebral column turns only slightly upwards, and its hæmal arches are somewhat expanded without fusion into plates. The intermuscular bones are almost completely obscured by the scales in the fossil, but there are traces of them above the vertebral column in the abdominal region, and both above and below this column in the caudal region. The post-temporal (*pt.*) is a thick plate, almost triangular in shape, and the supraclavicle (*sc.*) is a deep and narrow bone. The clavicle (*cl.*), as shown in impression, is expanded into a large smooth plate above the pectoral fin, which is inserted close to the ventral border. When addressed to the trunk this fin extends halfway to the insertion of the pelvic fins; its rays have a very long and stiff base, but are finely divided and articulated at the extremity. The pelvic fins (*p/v.*) are smaller than the pectorals, though similar in character, and inserted midway between the pectorals and the anal. The dorsal fin (*d.*) arises well in front of the middle point between the occiput and the caudal fin, somewhat in advance of the insertion of the pelvic fins. It comprises eighteen to twenty rays, of which the three foremost are closely pressed together, undivided, and gradually increase in length. The length of the fourth or longest ray much exceeds half the depth of the trunk at its insertion, and, like the following rays, is finely divided and articulated distally. The anal fin (*a.*) resembles the dorsal in character, but is much smaller and comprises only thirteen or fourteen rays. It is far behind the dorsal, and its origin is much nearer to that of the caudal than to the insertion of the pelvic fins. The remains of the caudal fin-rays (*c.*) show that they were comparatively stout. There are no fulcra on any of the fins. The scales are relatively large, cycloid, and smooth, occasionally with feeble traces of a slight radiating pectination at the hinder border, but usually exhibiting structural lines, including wavy concentric markings. They are scarcely displaced in the fossil, and are seen to be deeply overlapping, with the exposed area narrow and deep. The "lateral line" is scarcely traceable, but seems to produce a slight depression along some scales in a series above the vertebral column.

So far as the skeleton is preserved there is nothing in the

Wealden fossil just described to prevent its reference to an Elopine or Clupeoid fish; but as the European Wealden fish-fauna is essentially of a Jurassic type*, the specimen is more likely to belong to a member of the Leptolepidæ, with which it equally agrees. The skeleton of the trunk resembles that both of *Leptolepis* itself and of *Æthalion*; but the lack of jaws prevents an exact determination of the genus. The number of the vertebræ exceeds that of all known species of both genera except *Æthalion Vidali* †, and the relative shortness of the hinder caudal, as well as the anterior abdominal vertebral centra, is a feature peculiar to the new Wealden fish. The fins, as described, also distinguish this fossil from all species with which it can be compared. It therefore represents a new species, which I propose to name *Leptolepis valdensis* until the discovery of the head determines its precise generic position.

EXPLANATION OF PLATE I.

Fig. 1. *Leptolepis valdensis*, sp. n.; right side view of type specimen, one half nat. size.—Weald Clay; Southwater, Sussex. [Brit. Mus. no. P. 10440.] *a.*, anal fin; *br.*, branchios'egal rays; *c.*, caudal fin; *cl.*, clavicle; *d.*, dorsal fin; *hm.*, hyomandibular; *op.*, operculum; *plv.*, pelvic fins; *pop.*, preoperculum; *pt.*, post-temporal; *sc.*, supraclavicle; *sop.*, suboperculum.

Fig. 2. Ditto; caudal vertebræ of same specimen, nat. size.

XVIII.—On new Species of Histeridæ and Notices of others.

By G. LEWIS, F.L.S.

THIS is the thirty-first paper of this series, which dates from the year 1884. In the Histeridæ the absence or otherwise of prosternal striæ is sometimes of great significance, and serves to distinguish both genera and species. Thus, in *Teretriosoma* the striæ are wanting, in *Teretrius* they are well marked and very useful as specific characters; and in *Paromalus*, as the genus is now defined, the prosternal keel is marginate—that is, the striæ meet at both ends. In *Grammostethus*, also, the prosternal striæ are of importance, as being constantly similar in a series of fourteen cognate species, but which possess, however, *inter alia*, good specific characters.

* A. S. Woodward, "Note on the Affinities of the English Wealden Fish Fauna," *Geol. Mag.* [4] vol. iii. (1896) pp. 69-71.

† H. E. Sauvage, "Noticia sobre los Peces de la Caliza litográfica de la Provincia de Lérida," *Mem. R. Acad. Cienc. Barcelona*, [3] vol. iv. no. 35 (1903), p. 13, pl. ii. fig. 2.

But it is necessary to note that in other genera the striæ only help to identify certain species. In *Plasius* and *Placodes* they can only be used as specific characters. *Plasius cossyphus*, Mars., and *striatipectus*, Lew., are extremely similar, but the latter alone has a bistriate prosternum, and the same differences clearly separate *ellipticus*, Mars., from *javanus*, Er. In the genus *Placodes*, *caffer*, Er., has striæ, and they are wanting in *ebeninus*, Lew., species which otherwise are superficially very much alike.

It is to be regretted that at the present time there are genera which are not well defined, notably *Lioderma*, *Apoletes*, *Phelister*, and others, but, as time goes on, with increasing knowledge, some future student of the group may see a way to point out some salient characters not at present obvious, and, perhaps, by further subdivision introduce a more intelligent systematic arrangement.

Marseul's monograph will, however, remain the initial work on the family, and the figures of the species, drawn by him at the time of writing his descriptions, are so characteristic that they lead generally to the certain identification of the species. But in his time more material was wanted for an efficient classification, and not much advance has been made since for the same reason.

List of Genera and Species.

| | |
|---|-------------------------------------|
| <i>Lioderma pervalidum</i> , Blaisdell. | <i>Hister similis</i> . |
| <i>Hyposolenus</i> , gen. nov. | <i>Microhister Sheppardi</i> . |
| <i>Apoletes penalis</i> . | <i>Margarinotus, Marseul</i> . |
| — <i>punicatus</i> . | <i>Carcinops Voulogeri, Théry</i> . |
| <i>Platylister niponensis</i> , Lew. | <i>Monophilus Braunsi</i> . |
| <i>Platysoma germanum</i> . | <i>Probolosternus brevistrius</i> . |
| <i>Cornillus</i> , gen. nov. | <i>Exosternus rufulus</i> . |
| <i>Contipus, Marseul</i> . | <i>Reninus Salvini, Lew</i> . |
| <i>Eugrammicus</i> , gen. nov. | — <i>puncticollis</i> . |
| <i>Zabromorphus ordinarius</i> . | <i>Eretmotus planifrons</i> . |
| <i>Coptochilus, Rey</i> . | — <i>foveisternus</i> . |
| <i>Heterognathus, Rey</i> . | <i>Onthophilus niponensis</i> . |
| <i>Hister Marseuli</i> . | |

Lioderma pervalidum, Blaisdell, Lew. Ann. & Mag. Nat.
Hist. xiv. p. 139 (1904).

L. 12-16 mill. (absque mandibulis).

A series of this Californian species has been sent to me, and I understand that it will be shortly described in America. It is very distinct from *yucatecum*, Mars., by its more elongate and parallel outline, by being slightly more convex, by the second dorsal stria being complete, by the elytra being

sparingly punctured on the apical margin, by the propygidium being wholly punctured on the disk and not at the sides only, and by the third and fourth abdominal segments being transversely punctured. *L. yucatecum* has sometimes, but rarely, the second dorsal stria complete, but this variety was not known to Marseul.

HYPOSOLENUS, gen. nov.

Body oval or oblong-oval, somewhat convex; head retractile; mandibles dentate; labrum narrow and transverse; forehead striate; antenna, scape long and bent; thorax transverse, lateral stria strong and abruptly terminating after passing the anterior angle; prosternum bistriate; mesosternum with a deep anterior marginal furrow; pygidium convex and closely punctate. The other characters agree with those of *Plæsius*, in which genus the species *lævigatus*, Mars. (type), and *levis*, *bengalensis*, and *hamatus*, Lew., have been hitherto included.

Apobletes pœnalis, sp. n.

Ovalis, deplanatus, niger, nitidus; fronte excavata, punctulata; clypeo transverso, margine late sinuato; pronoto lateribus subrugose punctato, stria marginali antice interrupta; elytris striis dorsalibus 1-3 integris, 3 sinuata, 4 apicali, cæteris nullis; propygidio punctato in medio excepto; pygidio toto profunde punctato; mesosterno stria marginali haud interrupta.

L. $3\frac{1}{2}$ mill.

The above is similar to *A. cavifrons*, Lew., in that the mesosternal stria is complete. *A. excavatus* and *feriatus*, Lew., *Schaumi* and *tener*, Mars., belong to the same group, and the six species all closely resemble one another, but in the last four the mesosternal stria is interrupted. The type example of *A. excavatus* has the third dorsal stria interrupted, but in a longer series the stria is complete and in several the pygidium is deeply foveolate on each side at the base.

Hab. Andaman Islands.

Apobletes pumicatus, sp. n.

Oblongo-ovatus, deplanatus, niger, nitidus, antennis pedibusque piceis; fronte plana, haud striata, impunctata; pronoto stria marginali tenuiter impressa, brevi in angulo antico; elytris striis 1-3 integris, 4 apicali, dimidiata; propygidio disperso punctulato; pygidio basi transversim punctato; prosterno lato haud striato; mesosterno bisinuato, immarginato; tibiis anticis multidenticulatis.

L. $2\frac{2}{3}$ mill.

Ann. & Mag. N. Hist. Ser. 7. Vol. xx.

7

Very similar to *A. Marseuli*, Lew., and *pauperatus*, Sch., which together form a local section of the genus in which the head is smooth and without striae, the thorax has a very fine marginal stria close to the edge and confined to the region of the anterior angles, the pygidia are indistinctly punctured, and the prosternum broad and not striate. Specifically *pumicatus* may be known by its more oblong form and by the third dorsal stria being complete.

Hab. Cape S. Juan, Biafra, West Africa. In the Museum of Madrid and my own collection.

Platylister niponensis, Lew.

There is an example of this species in the Museum of Paris from the island of Kiushiu, and I think it likely that this is the true locality of the species, not Kioto on the main island, as I have recorded it. The last place is very far north for the occurrence in it of a genus which is essentially tropical or subtropical.

Platysoma germanum, sp. n.

Oblongum, subparallellum, nigrum, nitidum; fronte stria recta, integra; pronoto stria marginali antice interrupta; elytris striae 1-3 integris, 4-5 dimidiatis, suturali brevissima; mesosternum late emarginatum, stria integra, conspicue impressa; tibiis anticis 4-dentatis.

L. $3\frac{1}{4}$ mill.

Oblong, rather parallel, slightly convex, black and shining; the head, frontal stria straight anteriorly and complete, surface obscurely punctulate; the thorax punctured laterally, stria continued behind the neck and laterally it is close to edge (differing in this respect from *Alexandri*, Mars.); the elytra, striae 1-3 complete, 4-5 dimidiate, sutural very short and occupying a median position to the fifth stria, the humeral striae are wanting; the propygidium is coarsely punctured, but the punctures are not closely set; the pygidium, the punctures are similar but closer together; the prosternum, keel rather narrow, without striae; the mesosternum widely emarginate, with a well-marked marginal stria; the femora and tibiae are red.

Smaller but somewhat similar to *P. Alexandri*, Mars.; the thoracic stria, however, is close to the edge of the thorax laterally and is interrupted behind the neck; the thorax is punctured at the sides and there is no vestige of a sutural stria in Marseul's species. Marseul says of *P. Alexandri*

that there is a short oblique humeral stria, but this oblique stria, very common throughout this family, is not usually called a "humeral" stria—humeral striæ, as usually understood, are longitudinal.

Hab. Mikindani, E. Africa (*Raffray*).

CORNILLUS, gen. nov.

Body oval or oblong-oval; forehead impressed longitudinally, stria biarcuate; thorax, antennal fossa in the anterior angle; elytra, striæ fine, crenate, or punctiform; propygidium finely and evenly punctured, binodulose; prosternum bistriate; anterior tibiæ 4-dentate.

This genus has much general similarity to *Omalodes*; the species to be included in it are *tuberculipygus*, Sch., *bullatus*, *tuberculatus*, and *tuberosus*, Lew.

CONTIPUS, Marseul, Mon. p. 548 (1853).

I propose to include in this genus *C. flexuosus*, Sch., as the type, because it is the commonest species existing in collections, and *digitatus*, Mars., with *immarginatus* and *oblongus*, Lew. For the present I would also include the American species, *abhorrens*, Sch., *platanus* and *subquadratus*, Mars. The African species with didymous elytral stria I assign to the new genus below.

EUGRAMMICUS, gen. nov.

Body oval, more or less convex; head transverse, mandibles equal and strongly dentate, labrum short and transverse, frontal striæ complete; thorax with two lateral striæ; antennal fossæ are open from below and shallow and somewhat similar to those of *Contipus*; elytra, striæ are wide and shallow, with fine crenate edges (Marseul termed them didymous), striæ 1-4 complete, 5 and sutural nearly complete, sutural turning outward before the base; pygidia almost impunctate; mesosternum feebly sinuous anteriorly; tibiæ dilated, anterior strongly 3-dentate. Other characters similar to those of *Contipus*.

Type, *Contipus didymostrius*, Mars.

The other known species are *sinuosus* (convex), *proximus*, and *fractistrius*, Lew. (less convex); at present only unique examples are in collections, so that it is highly probable the species have secretive and peculiar habits.

Zabromorphus ordinarius, sp. n.

Ovatus, parum convexus, niger, nitidus; fronte irregulariter punctata; elytris striis 1-3 dorsalibus integris, 4 antice abbreviata, 5 subobsoleta, suturali fere dimidiata; propygidio pygidioque dense punctatis.

L. 6 mill.

Oval, rather convex, black and shining; the head irregularly punctured, stria complete; the thorax smooth, with two lateral striæ, interstice at and near the anterior angle with a few scratches and punctures; the elytra, striæ, inner humeral strong and abbreviated anteriorly for about one third, 1-3 also strong with fine crenate edges, 4 somewhat similar but finer and but a little longer than the inner humeral stria, 5 very short, apical, and traceable only as punctures, sutural similar to the fourth but apical and not reaching beyond the middle; the pygidia are densely and very evenly punctured; the mesosternum is very feebly sinuous, with a well-marked marginal stria; the anterior tibiæ 3-dentate.

The most peculiar characteristic of this species is the sculpture of the thoracic interstice.

Hab. Fort Salisbury, Matabeleland.

MACROLISTER, Lewis, Ann. & Mag. Nat. Hist. xiv. p. 145 (1904), = *Coptochilus*, Rey, L'Exchange (Lyon), part 14, p. 4 (1888), type *Hister major*, L.; *Pachylister*, Lewis, l. c., = *Heterognathus*, Rey, l. c., type *Hister inæqualis*, Ol.

Rey's names do not appear in the 'Zoological Record' nor in "Scudder" or any of the later lists of genera; Rey writes of them as "sous-genres," but they are natural genera, and must be recognized as such. There are some specific names in Rey's paper also, but they are synonymic and of no importance.

As Rey's lines are very short and have escaped notice for nearly twenty years, I reproduce them:—

"L'*Hister major*, Lin., à cause de son labre échancré et des côtés du prothorax densément ciliés-frangés, mériterait de constituer au moins un sous-genre (*Coptochilus*, Rey)."

"L'*Hister inæqualis*, F., en raison de ses mandibules inégales, pourrait également donner lieu à une coupe sous-générique (*Heterognathus*, Rey)."

This is all; and I regret reinstating names introduced so casually, but the rules of nomenclature apparently demand it*.

Hister Marseuli, sp. n.

Breviter ovatus, convexiusculus, niger, nitidus; fronte stria integra, labro trigono; pronoto stria laterali interna integra basi haud incurvata, externa ante medium abbreviata; elytris striis 1-3 integris, 4-5 basi multo abbreviatis; pygidio levissime punctulato; mesosterno margine bistriato; tibiis anticis 3-dentatis.

L. $8\frac{1}{4}$ mill.

Shortly oval, somewhat convex, black and shining; the head, frontal stria complete, labrum triangular; the thorax, outer lateral stria confined to the region of the anterior angle, inner strong and complete, with a rather wide interstice, not incurved at the base, finely crenate behind the neck; the elytra, striæ, subhumeral deep but shortened at both ends, 1-3 dorsal complete, but the third is lightly impressed apically, 4-5 faint, punctiform and well shortened anteriorly, sutural stria discal and bending from the suture at both ends; pygidia somewhat opaque, microscopically punctured, and there is a fine raised exterior margin to the pygidium; the mesosternum is emarginate, with a stria on each side of the emargination, and behind it, leaving a rather wide margin, is a complete stria which turns to the outer edge at the suture and does not join the metasternal stria; the anterior tibiæ are 3-dentate.

This species closely resembles *H. adjectus*, Mars., but it is less oval and the thoracic stria is not incurved at the base, the pygidia are more minutely punctured, and the mesosternum has two marginal striæ. *Hister adjectus*, Mars., is reported from Natal, and the specimens I have determined as such are from Kamerun and the French Sudan; and I may not know Marseul's species except from description.

Hab. Region of the Upper Congo.

The form of the pygidium of the above is similar to the pygidia of *Pachylister caffer*, Er., *ceylanus*, Mars., *pygidialis*, Lew., besides *Hister adjectus*, Mars., and others; but this structure does not at present suggest itself to be of generic importance.

Hister similis, sp. n.

Ovatus, convexus, niger, nitidus; fronte leviter punctulata, stria

* Since writing the above I find that Rey's names are preoccupied—the first in Hemiptera (1843), the second in Pisces (1854) and in Coleoptera (1861).

integra antice recta; pronoto striis duabus pone oculos coalescentibus, interstitiis pone angulos punctatis; elytris striis 1-4 et humerali integris, 5 basi abbreviata, suturali magis longa, humerali externa brevissima; propygidio pygidioque dense punctatis; mesosterno haud sinuato, stria marginali integra; tibiis anticis 3-dentatis.

L. $7\frac{1}{4}$ mill.

Extremely similar to *H. ceneus*, Lew., but differs in being black and rather less convex. Also there is a fine punctuation only within the stria at the anterior angle, not a band of conspicuous points; the outer humeral stria is median and very short, scarcely more than an elongate puncture, and the pygidia are not quite so densely punctate.

Hab. Zambesi River.

Microlistes Sheppardi, sp. n.

Ovalis, parum convexus, niger, nitidus; antennis pedibusque nigris; fronte stria transversa in media interrupta, stria anterieus arcuata; pronoto lateribus distincte punctato, stria marginali integra; elytris striis humeralibus nullis, 1-3 dorsalibus integris, validis, 4 et suturali æqualibus antice abbreviatis, 5 dimidiata; propygidio sparse punctato; pygidio fere lævi; prosterno bistriato, striis in medio interruptis; mesosterno late emarginato, stria integra; tibiis anticis 4-dentatis.

L. $3\frac{1}{2}$ mill.

This species is larger than *M. coronatus*, Lew., but extremely like it. It differs by its more oval form, by the transverse frontal stria being broken in the middle, by the thorax being more distinctly punctate, by the elytral striæ being deeper and distinctly crenate, and the interstice between the first and second striæ is markedly wider at the base; the prosternal stria are interrupted like those of *coronatus*, and this may prove to be a generic character of many species. In *coronatus* the elytral striæ are less deep and very feebly crenate; in both species there is a transverse crenate stria marking the suture of the mesosternum, and laterally it is continued along the metasternum.

It is satisfactory to find a second species which possesses the characters on which the genus was lately established; to these characters may now be added the form of the frontal striæ and the similarly interrupted prosternal striæ.

Hab. Beira, East Africa (*P. A. Sheppard*). Several examples.

MARGARINOTUS, Marscul, Mon. p. 549 (1853).

The species of this genus have open circular antennal fossæ, and this structure suggests its position to be near *Grammostethus* and *Atholus*. It cannot remain between *Contipus* and *Hister*, where Marscul placed it.

Carcinops Voulogeri, Théry.

In the Catalogue of 1905 I placed this species erroneously in *Kissister*. Mons. Théry has kindly given me the type example.

Monoplius Braunsi, sp. n.

Orbicularis, convexus, niger, opacus; fronte plana; elytris seriebus septem plagarum lævium subobsoletis, striis dorsalibus nullis; prosterno bistriato; metasterno antice foveolato.

L. $4\frac{1}{2}$ –5 mill.

Orbicular, convex, black, and opaque; the head, lateral striæ reach a little beyond the eye, surface flat and rugosely punctured; the thorax with three lateral small punctures and one behind the eye (these are seen in other species), surface densely and strigosely punctured; the elytra, striæ, outer humeral distinct and complete, inner also complete but less marked and varying in individuals, dorsal obliterated; the smooth circular spaces, as seen in *pinguis*, Lew. (pl. xx a. fig. 3, Ann. & Mag. Nat. Hist. xi. 1893), are obscured by the dense longitudinal strigosity of the general surface; the propygidium is densely and longitudinally strigose; the pygidium is punctured on the disk and rather broadly rugose along its base; the prosternum is clearly punctured, keel bistriate, the striæ bend towards each other in the middle; the mesosternum, marginal stria complete; the metasternum has a fovea close to the suture, and there is a more or less deep median linear impression which connects the fovea in the base edge, and sometimes there are two small foveæ on the first abdominal segment; the pilosity on the thighs &c. when existing is reddish and always sparse. The female has a very faint longitudinal impression before the apex of the pygidium, but it is only seen in certain lights.

The above is somewhat similar in size to *sigillatus*, Péring., in which, however, the elytral smooth spaces are much more distinct.

Hab. Willowmore, Cape Colony. Many examples captured by Dr. H. Brauns, occurring with *Hodotermes viator*, Latr. (*Havilandi*, Sh.).

Probolosternus brevistrius, sp. n.

Ovalis, parum convexus, niger, nitidus; fronte minute punctulata, antice haud impressa, stria marginali integra; pronoto lævissime et sparse punctulato; elytris striis 1-4 integris, 4 basi hamata, 5 dorsali brevissima, suturali dimidiata; propygidio fere lævi.

L. $3\frac{3}{4}$ mill.

Oval, rather convex, black and shining; the head, marginal stria complete, not impressed; the epistoma, surface very minutely and sparsely punctulate; the thorax, marginal stria complete, surface sparsely and finely punctured, with an antescutellar fovea; the elytra, interstices of striæ smooth, striæ, outer humeral fine, inner humeral and 1-4 dorsal strong and complete, 4 being markedly hamate at the base, 5 is very short and dorsal, being just behind the middle of the disk; pygidia are almost smooth, but a few fine points are seen in certain lights; the prosternum narrow and bistriate; the mesosternum markedly marginate; the tibiæ are dilated.

The short discal fifth stria distinguishes this species from the other four at present known.

Hab. Sierra Leone. A single example in the British Museum.

Exosternus rufulus, sp. n.

Ovatus, convexus, nigro-piceus, nitidus; fronte conspicue rugoso punctata; pronoto stria marginali integra; elytris striis tenuiter impressis, margine late rufis; prosterno striis antice conjunctis; mesosterno parum acuto, marginato; pedibus rufis.

L. $3\frac{1}{4}$ mill.

Oval, convex, piceous and shining; the head rugosely punctured, especially on the anterior part, marginal stria interrupted in the middle, apparently obliterated by the rugosities; the thorax, marginal stria complete, surface rather closely punctured at the sides, less and more finely so behind the head, and on the disk nearly smooth; the elytra somewhat broadly red at the sides and along the apical margin, the outer humeral is complete, inner very short and basal, dorsal 1-4 complete, 5 very short and apical, sutural complete and hamate at the base; the propygidium is densely punctured; the pygidium has a fine punctuation at the base and is nearly smooth on the apex; the prosternum, striæ widen out slightly at the base, are parallel along the sides, and join, forming an arched outline anteriorly; the mesosternum distinctly marginate and somewhat acute in the middle; the legs are red and the anterior tibiæ are 6-7-dentate.

This is the third species of the genus known.

Hab. The Matopo Mountains, Matabeleland (Guy A. K. Marshall).

Reninus Salvini, Lew., occurs in the nests of *Æcodoma cephalotes*, and it is probable that all the species of the genus *Reninus* and *Discocelis* are formicicolous. *Epiglyptus (Hister) costatus*, Mars., also associates with the *Æcodoma*.

Reninus puncticollis, sp. n.

Breviter ovatus, convexus, niger, nitidus; fronte depressa, stria angulata; pronoto punctato (basi excepta); elytris striis sub-humerali et 1 dorsali integris, 1-3 postice, 5 et suturali totis punctiformibus; tibiis extus valde dilatatis.

L. $3\frac{1}{4}$ - $3\frac{1}{2}$ mill.

Shortly oval, convex, black and shining; the head, frontal stria strong and angulate before the eyes, depressed before the epistoma, surface with bowed striæ representing incomplete parts of shallow punctures and set very irregularly; the thorax, marginal stria very fine and apparently very narrowly interrupted behind the middle of the neck, the inner stria is close to the marginal stria and traceable anteriorly to a point behind the eye, anterior angles obtuse and reddish, surface with coarse punctures, points most dense on the outer part, and the scutellar region is smooth, the basal edge is narrowly and microscopically strigose; the elytra, striæ, inner humeral and first dorsal are complete and somewhat carinate on the basal part, 1-3 are abbreviated on or before the middle, but are continued apically by shallow punctures arranged more or less in two rows, the fourth stria is hamate at the base, 5 and sutural are indicated by shallow punctures, the fifth is shortened at the middle, the sutural continues to the base; the pygidia have a shallow sculpture, consisting apparently of crescents or half punctures which have an imbricate outline; the prosternum, lobe somewhat truncate anteriorly and rather strongly marginate, with a few irregular and shallow punctures, surface microscopically strigose, keel bistrate, striæ join anteriorly before reaching the suture, the inner stria is abbreviated behind and the interstices of the striæ are smooth, the anterior area of the keel has a few irregular punctures somewhat like those of the lobe; the mesosternum, marginal stria very fine, sinuous in the middle, and not very close to the edge, from each basal angle proceeds a fine bowed stria, unconnected with the lateral striæ, and both ends of them turn outwards, the sides are bistrate,

the striae being also common to the metasternum; the tibiae are dilated on the outer edge.

This species resembles *seminitens*, Sch., in the punctuation of the thorax and in the punctiform sutural stria.

Hab. British Guiana, "Bartica, Demerara" (R. J. Crew); also Cayenne.

Eretmotus planifrons, sp. n.

Orbicularis, convexus, niger, nitidus; fronte subopaca, immarginata, haud striata; pronoto basi utrinque foveolato; elytris striae 1-2 brevibus; prosterno opaco minutissime rugoso, antice indistincte punctato; pedibus rufo-piceis.

L. $2\frac{3}{4}$ mill.

Orbicular, convex, black and shining; the head is somewhat opaque, being microscopically rugose, very slightly impressed anteriorly, and without a frontal stria; the thorax, stria feebly sinuous before the basal angles, anterior angles not very prominent, less so than those of *Lucasi*, Mars., and foveolate at the base close to the outer margin; the elytra, striae, outer humeral dimidiate, inner complete, 1-2 dorsal basal and very short; the pygidia are finely and somewhat irregularly punctured, the points being most distinct at the bases of the segments; the prosternum, surface opaque and microscopically rugose, with indistinct punctures on the anterior half of the keel, striae rather fine, widely sinuous laterally and widening out anteriorly somewhat similarly, but rather more, to those of *corpulentus*, Lew. (see figure, Ann. & Mag. Nat. Hist. x. pl. xix. fig. 1, 1892); the mesosternum, marginal stria is very fine and the fovea shallow.

Hab. Mount Babor, Algeria (A. Théry). Found with *Aphanogaster testaceopilosa*.

Eretmotus foveisternus, sp. n.

Orbicularis, convexus, niger, nitidus; femoribus nigris, tibiis obscure rufis; fronte stria laterali carinata; elytris striae 1 integra, 2-3 postice evanescentibus; prosterno striae antice abbreviatis; mesosterno foveis laterali profunde et circulariter excavatis.

L. $2\frac{1}{4}$ mill.

Orbicular, convex, black and shining; the femora are black and the tibiae obscurely red; the head, surface opaque, rugosely punctured, sculpture shallow, stria laterally carinate; the thorax margined laterally, punctured chiefly behind the neck and anterior angles, angles truncate; the elytra, striae, 1 complete, 2-3 basal and evanescent before the middle, outer

humeral carinate and extends beyond the middle, inner complete but only carinate at the base; the pygidia are evenly and not densely punctured; the prosternum, striæ sinuous and well-marked, but abbreviated anteriorly before the suture, keel distinctly punctured and obsoletely rugose; the mesosternum, lateral foveæ are deep and circular and the margin is wider than that of *E. Leprieuri*, Mars.

The species of *Eretmotus* are difficult to differentiate, but the punctuation of the keel, the deep circular foveæ in the mesosternum, and the colour of the legs will distinguish the above from the other two small Algerian species known, viz. *carinatus*, Lew., and *Leprieuri*, Mars.

Hab. Yakouren, Algeria.

There are sixteen species of *Eretmotus* now known.

Onthophilus niponensis, sp. n.

Ovatus, niger, subnitidus; fronte leviter concava, clypeo quadrato; pronoto 6-costato vix dense punctato; elytris 3-costatis, basi in medio foveolatis; pygidio in medio longitudinaliter costato, dense punctato.

L. 2 $\frac{3}{4}$ mill.

Oval, black, somewhat shining; the head slightly concave between the eyes, the clypeus is nearly quadrate, being less widened posteriorly than that of *O. globulosus*, Ol.; the thorax is rather densely punctured, lateral margins narrowly and slightly raised, surface 6-costate, outer costa short and near the base, intermediate one third longer and feebly oblique, the two before the scutellum are short, parallel to each other, and clearly separate; the elytra are 3-costate, the interstices with five fine carinules, and between the third costa and the suture the outer carinules are crenate, at the base of the elytra is a deep fovea between the second and third costæ; the propygidium is densely punctured, with a median longitudinal carina.

This species closely resembles *O. globulosus*, F., but it differs by the clypeus being less wide at the base, by the thoracic punctures being closer, smaller, and less deep, and the elytral fovea is conspicuous and occupies the whole breadth of the interstice. As regards the Japanese species, it is most similar to *ostreatus*, Lew., which is, however, much larger, and the median thoracic costæ have appendages behind the neck.

Hab. Tokio, Japan. Many specimens in the Museum of Paris and in my own collection.

XIX.—*Descriptions of Two new Freshwater Fishes discovered by Dr. W. J. Ansorge in Mossamedes, Angola.* By G. A. BOULENGER, F.R.S.

Labeo Ansorgii.

Body strongly compressed, its depth equal to length of head and contained 4 times in total length. Head once and $\frac{2}{3}$ as long as broad; snout broad, truncate, feebly projecting, beset with conical horny tubercles; eye nearly perfectly lateral, its diameter 4 times in length of head and once and $\frac{3}{4}$ in interorbital width; width of mouth, with lips, about half that of head; rostral flap not denticulated; lips bordered with rounded papillæ, their inner surface with numerous transverse plicæ; two barbels on each side, anterior $\frac{1}{3}$, posterior $\frac{3}{4}$ diameter of eye. Dorsal IV 10, with concave upper border, a little nearer root of caudal than end of snout, longest ray slightly longer than head. Anal III 5, nearly reaching root of caudal. Pectoral nearly as long as head, not reaching base of ventral, which is below middle of dorsal. Dorsal deeply forked, with acutely pointed lobes. Caudal peduncle slightly longer than deep. Scales $36 \frac{6\frac{1}{2}}{7\frac{1}{2}}$, 4 between lateral line and root of ventral, 16 round caudal peduncle. Silvery, back brownish.

Total length 65 mm.

A single specimen from shallow swamps at Dongwenna.

A very distinct species, to be placed between *L. barbatus*, Blgr., and *L. capensis*, A. Smith.

Paratilapia angusticeps.

Depth of body about 3 times in total length. Head very strongly compressed, $2\frac{3}{5}$ to 3 times in total length; lower jaw projecting; præmaxillary processes very long, extending to between the eyes; snout pointed, twice as long as the eye in the adult (not longer than the eye in the young); eye $3\frac{1}{2}$ (young) to 5 times in length of head, its diameter at least equal to interorbital width; mouth very oblique, extending to below anterior border of eye; teeth in 3 or 4 series, outer largest; scales on cheek small, in 7 to 9 series; large scales on the opercle. Gill-rakers short, 11 or 12 on lower part of anterior arch. Dorsal XV-XVI 14-16; spines slightly increasing in length to the last, which measures $\frac{1}{3}$ to $\frac{2}{5}$ length of head. Anal III 11-13; third spine stronger and as long as or a little shorter than last dorsal. Pectoral $\frac{3}{5}$ to $\frac{2}{3}$ length

of head, not reaching origin of anal. Caudal rounded. Caudal peduncle as long as deep. Scales denticulate, 36-39 $\frac{6-7}{15-18}$; lateral lines 21-24/13-17. Brownish above, yellowish beneath, with dark brown spots or marblings or with 7 or 8 indistinct dark bars on the body; a blackish opercular spot; dorsal, anal, and caudal fins with round brown or blackish spots.

Total length 160 mm.

Several specimens were obtained by Dr. Ansorge. A specimen measuring 215 mm., from the Zambesi, has been submitted to me by Dr. J. D. F. Gilchrist.

Closely allied to *P. robusta*, Gthr.

XX.—Description of a new Frog discovered by Dr. W. J. Ansorge in Mossamedes, Angola. By G. A. BOULENGER, F.R.S.

Rana cryptotis.

Tongue rather feebly notched behind. Vomerine teeth in two oblique groups between the choanæ. Habit very stout. Head short, snout rounded; interorbital space narrower than the upper eyelid; tympanum completely hidden under the skin. Fingers short, pointed, first and second equal; toes short, one-third webbed; subarticular tubercles of toes very prominent, conical; inner metatarsal tubercle very large, very prominent, shovel-shaped, sharp-edged, at least as long as the inner toe; a small, round, outer metatarsal tubercle; a round tarsal tubercle, just below the tibio-tarsal articulation. The tarso-metatarsal articulation reaches the eye. Skin smooth. Pale greyish or brownish above, with dark-edged grey or brown spots disposed with greater or less symmetry; an interrupted dark cross-bar between the eyes; back sometimes with white or pink dots; a light vertebral streak often present; hind limbs with dark transverse spots, not forming complete cross-bars; lower parts white.

From snout to vent 31 mm.

Numerous specimens were obtained by Dr. Ansorge at Catequero, Ponang Kuma (Dongwenna), and in the Kafitu Swamps.

The hidden tympanum and the tarsal tubercle well distinguish this small frog from *R. Delalandii* and other allied species from Africa.

XXI.—*On the African Mongooses usually referred to the Herpestes gracilis Group.* By R. C. WROUGHTON.

THE following notes refer to the section of the Herpestinæ containing the forms of the small mongoose with a dark tail-tip (usually black, rarely brown). The members of the section are found all over Africa, varying somewhat in size and colour, as was to be expected.

The following is a list of the names already given to members of this section, so far as I have been able to ascertain :—

1. 1835. *Herpestes sanguineus*, Rüppell, N. Wirb. Abyss. p. 27.
2. 1835. *Herpestes gracilis*, Rüppell, N. Wirb. Abyss. p. 29.
3. 1835. *Herpestes mutigella*, Rüppell, N. Wirb. Abyss. p. 29.
4. 1836. *Ichneumon ratlamuchi*, Smith, App. Rep. Exp. C. Afr. p. 42.
5. 1836. *Ichneumon Cawi*, Smith, App. Rep. Exp. C. Afr. p. 42.
6. 1836. *Cynictis melanurus*, Martin, P. Z. S. p. 36.
7. 1838. *Herpestes badius*, Smith, Ill. Afr. Zool. ii. pl. iv.
8. 1839. *Ichneumia nigricaudatus*, Geoffroy, Mag. Zool. p. 18.
9. 1847. *Herpestes Galinieri*, Guérin & Ferret, Galinier, Voy. Abyss. Atlas, Zool. pl. i.
10. 1848. *Herpestes ochraceus*, Gray, P. Z. S. p. 138.
11. 1849. *Herpestes punctulatus*, Gray, P. Z. S. p. 11.
12. 1850. *Herpestes Lefebvrei*, Desmurs & Prévost, Lefebvre, Voy. Abyss. Atlas, Zool. pl. i.
13. 1852. *Herpestes ornatus*, Peters, Reis. Moss. p. 117.
14. 1855. *Herpestes ochromelas*, Pucheran, Rev. Zool. vii. p. 393.
15. 1861. *Herpestes iodoprymnus*, Heuglin, Nov. Act. Ac. Leop. xxix. p. 23.
16. 1864. *Herpestes Granti*, Gray, P. Z. S. p. 561.
17. 1864. *Calogale venatica*, Gray, P. Z. S. p. 564.
18. 1877. *Herpestes ruficauda*, Heuglin, Reis. N.O.-Afr. p. 41.
19. 1877. *Herpestes mutscheltschela*, Heuglin, Reis. N.O.-Afr. p. 43.
20. 1894. *Herpestes Neumanni*, Matschie, SB. Ges. naturf. Fr. Berl. p. 121.
21. 1904. *Herpestes ochraceus perfulvidus*, Thomas, Ann. & Mag. Nat. Hist. p. 96.
22. 1904. *Herpestes ochraceus fulvidior*, Thomas, Ann. & Mag. Nat. Hist. p. 97.
23. 1905. *Herpestes Bocagei*, Thomas & Wroughton, Ann. & Mag. Nat. Hist. xvi. p. 170.

Practically all these forms were described as distinct species, some even as belonging to separate genera. In 1882, in his paper on the African Herpestinæ (P. Z. S. p. 59), Mr. Thomas brought all these forms together as varieties of one species, i. e. *gracilis*, Rüpp. In 1898 Mr. de Winton, with increased material to guide him, pointed out that Mr. Thomas's variety "*d*" must rank as a distinct species on account of differences in skull-characters. At present the

material is at least five times that which Mr. de Winton examined. It divides easily into two groups—a smaller, with a hind foot (circ.) 50 mm. and a skull-length (circ.) 57 mm., and a larger, with a hind foot (circ.) 60 mm. and a skull-length (circ.) 62 mm. The group of smaller animals subdivides into (1) Mr. Thomas's variety "*d*," that is *Mungos ochraceus*, Gray, with its races; and (2) into a group of which the oldest representative is *Cynictis melanurus*, Mart. Similarly the larger forms are separable into two groups, viz. a northern, in which the crown and nape are coloured like the back, and a southern, characterized by a tawny suffusion on the head and neck. This colour-pattern is so striking and constant that (combined with the fact that a band across Africa from east to west, in which only a small form is found, separates the habitats of the northern and southern groups) I deem myself justified in ranking this form as a distinct species (or, more correctly, group of species).

Key.

- I. Size smaller; hind foot (circ.) 50 mm.
 - A. Brain-case swollen anteriorly, postorbital constriction sudden.
 - a. Hairs of body annulated. (Abyssinia.) (1) *ochraceus*, Gray.
 - b. Hairs not annulated in dorsal region, which, with tail, is darker than back. (Somali.)..... (2) *o. fulvidior*, Thos.
 - c. Hairs of body not annulated. (Somali.) (3) *o. perfulvidus*, Thos.
 - B. Brain-case narrowing gradually forward to postorbital constriction.
 - a. Skull larger; condylo-basal length 60-62 mm.; zygomatic breadth 33-34.
 - a¹. General colour "burnt umber"; face and crown like body; length *c-m*¹ 23 mm. (Gold Coast.) (4) *melanurus*, Mart.
 - b¹. General colour "burnt umber"; crown black; length *c-m*¹ 21.7 mm. (Zanzibar Island.) (5) *m. Lasti*, subsp. n.
 - b. Skull smaller; condylo-basal length 58-60 mm.; zygomatic breadth 29.
 - a¹. General colour yellow; length *c-m*¹ 20 mm. (Angola.) (6) *m. Bocagei*, Thos. & [Wr.
 - b¹. General colour drab; length *c-m*¹ 21 mm. (Cape Verd.)..... (7) *m. canus*, subsp. n.
 - c¹. General colour red-umber; length *c-m*¹ 20.7 mm. (Zomba.) (8) *m. zombæ*, subsp. n.
- II. Size larger; hind foot (circ.) 60 mm.
 - A. No tawny suffusion on head and neck.
 - a. Tail-tip chestnut. (Kordofan.) (9) *sanguineus*, Rüpp.
 - b. Tail-tip black.
 - a¹. General colour pinkish drab; hind foot 58 mm. (Abyssinia.) (10) *s. gracilis*, Rüpp.

- b¹. General colour brown; hind foot 62 mm. (Abyssinia.) (11) *s. mutgigella*, Rüpp.
 c¹. General colour "seal-brown"; hind foot 58 mm. (Ruwenzori.) (12) *s. proteus*, Thos.
 d¹. General colour "olive-buff"; hind foot 58 mm. (Fort Hall, B.E.A.) (13) *s. ibeæ*, subsp. n.
 B. Tawny suffusion on head, neck, and shoulders.
 a. Hair not or only obscurely annulated.
 a¹. Tail-tip brown. (Ugogo.) (14) *Granti*, Gray.
 b¹. Tail-tip black. (N.W. Transvaal.) (15) *ratlamuchi*, Sm.
 b. Hair annulated. (S. Africa.) (16) *Cauui*, Sm.

1. *Mungos ochraceus*, Gray.

1848. *Herpestes ochraceus*, Gray, P. Z. S. p. 138.

Gray's type is in the collection.

The following are approximate dimensions:—

Head and body 250 mm.; tail 240; hind foot 48.

Skull: condylo-basal length 58; basilar length 53; greatest breadth 31; palate breadth across p^4 20; length $c-m^1$ 19.6.

The skull is recognizable from that of *M. gracilis* &c. by the inflation anteriorly of the brain-case, recalling somewhat the shape of the quite young skull in both these species.

Gray describes the colour as "Pale brownish yellow, very minutely mixed or punctated with a darker tint."

Hab. Type locality "Abyssinia." (Type, B.M. no. 44. 7. 30. 44.)

5. 5. 11. 3. Near Berbera (*Mr. Drake Brockman*).

98. 6. 9. 3. Jefa Muder, Somaliland (*Messrs. Hawker & Cheetham*).

59. 7. 9. 10. Coast of Africa (*Verreaux*).

2. *Mungos ochraceus fulvidior*, Thos.

1904. *Herpestes ochraceus fulvidior*, Thomas, Ann. & Mag. Nat. Hist. xiv. p. 97.

Thomas describes this form as grizzled ochraceous, darker than in the typical form, the median dorsal area unannulated, strong tawny ochraceous, in continuity with the tawny of the tail.

Dimensions:—

Head and body 250 mm.; tail 240; hind foot 51; ear 26.

Skull: condylo-basal length 58; basilar length 53; greatest breadth 31; palate breadth across p^4 19; length $c-m^1$ 20.5.

Hab. Type locality Mandeira, Somali. (Type, B.M. no. 97.8.9.7: *Dr. Atkinson.*)

98.3.9.3. N. Haud, Somali (*C. V. A. Peel.*)

3. *Mungos ochraceus perfulvidus*, Thos.

1904. *Herpestes ochraceus perfulvidus*, Thomas, Ann. & Mag. Nat. Hist. xiv. p. 96.

Thomas describes this species as unannulated, "uniform bright ochraceous on head, body, and outer side of limbs."

Dimensions of the type (measured in the flesh):—

Head and body 275 mm.; tail 220; hind foot 51; ear 25.

Skull: condylo-basal length 51.5; basilar length 53.5; greatest breadth 34; palate breadth across p^4 19; length $c-m^1$ 20.

The above measurements of body and tail seem to me to be open to doubt. There is nothing to show that this form differs at all strikingly in size from the two preceding ones.

Hab. Type locality Wardair, Somali. (Type, B.M. no. 4.5.9.9: *Capt. Dunn.*)

7.4.4.1-2. Ber, near Burao, Somali (*Mr. Drake Brockman*).

4. *Mungos melanurus*, Mart.

1836. *Cynictis melanurus*, Martin, P. Z. S. p. 56.

Martin's description is very meagre, but, besides the actual type, there are several specimens from the same and neighbouring localities. The following is a short general description of this form:—General colour "burnt sienna." Hairs of back short (10-12 mm.), "orange-rufous," ringed and tipped with black, forming a grizzling which tends to produce transverse alternate dark and light bands, this tendency extending much further forward than in the Abyssinian forms, visible even on the neck behind the ears; face the same colour as the back, but much more finely grizzled; tail coloured as back, with the usual black tip.

Dimensions:—

Head and body 300 mm.; tail 280; hind foot 53.

Skull: condylo-basal length (circ.) 63; basilar length (circ.) 58; zygomatic breadth 34; palate breadth across p^4 21; length $c-m^1$ 23.

Hab. Type locality Sierra Leone. (Type, B.M. no. 55.12.24.229.)

72.2.22.2. Ashanti.

76.10.28.9. Gold Coast (*Col. Strachan*).

Ann. & Mag. N. Hist. Ser. 7. Vol. xx.

5. *Mungos melanurus Lasti*, subsp. n.

General colour near "Mars brown," with the usual black tail-tip. Hairs of back 10-12 mm. long, black, with a lower pale buff and a subterminal tawny ring. Face and crown almost black, very finely grizzled with tawny; tail coloured like the back, individual hairs 20 mm. long.

Dimensions:—

Head and body (circ.) 270 mm.; tail (circ.) 250; hind foot 50; ear 25.

Skull: condylo-basal length 62; basilar length 56; zygomatic breadth (?); palate breadth across p^4 21.5; length $c-m^1$ 21.7.

Hab. Type locality Zanzibar Island. (Type, B.M. no. 6. 6. 5. 11.)

6. 6. 5. 8-16. Zanzibar Island (*J. T. Last*).

6. 6. 5. 27-29 (skulls only). Zanzibar Island (*J. T. Last*).

The black mask is very noticeable; in a series of nine specimens it is absent in only one, in which the face-hairs are markedly longer, more coarsely annulate, and a red-brown is substituted for the usual pale buff.

In the general colour there is a strong likeness between *M. m. Lasti* and *M. melanurus* of the West Coast, but the black face suffices to distinguish the former. Even the exceptional individual mentioned above has a quite different look to the minutely but distinctly grizzled mask of *M. melanurus*.

6. *Mungos melanurus Bocagei*, Thos. & Wr.

Herpestes gracilis punctulatus, Bocage.

1905. *Herpestes Bocagei*, Thomas & Wroughton, Ann. & Mag. Nat. Hist. xvi. p. 170.

The general colour is a bright ochraceous, strikingly different from the red-brown and drab of the preceding more northern forms.

Dimensions:—

Head and body 265 mm.; tail 235; hind foot 52; ear 25.

Skull: condylo-basal length (probably circ.) 58; zygomatic breadth 29; palate breadth across p^4 19; length $c-m^1$ 20.

Hab. Caconda, Angola. (Type, B.M. no. 5. 5. 9. 13.)

7. *Mungos melanurus canus*, subsp. n.

General colour drab. Hairs of the back 15 mm. long, black, with two cream-buff rings, one of which is subterminal,

leaving only a very short black tip. Face coloured like back, but the grizzling finer; tail coloured like back.

Dimensions:—

Head and body (circ.) 260 mm.; tail (circ.) 250; hind foot 52.

Skull: condylo-basal length (circ.) 58; basilar length (circ.) 53; zygomatic breadth 29; palate breadth across p^4 19; length $c-m^1$ 21.5.

Type (young adult), B.M. no. 72. 12. 12. 5.

Hab. Cape Verd.

8. *Mungos melanurus zombæ*, subsp. n.

General colour "raw umber," with black tail-tip.

Hairs of back 10–12 mm. long, dirty white at base, followed by four rings, black and cream-buff alternately, with a black tip, but in a very large proportion of the hairs the subterminal pale ring only gradually darkens to black at the extreme tip. Face darker than back, almost black, very finely grizzled with white; tail and feet coloured like back.

Dimensions:—

Head and body (circ.) 260 mm.; tail (circ.) 220; hind foot 48; ear 24.

Skull: condylo-basal length (circ.) 60; basilar length 55; zygomatic breadth 29; palate breadth across p^4 19; length $c-m^1$ 20.7.

Hab. Type locality Zomba, Nyasa. (Type, B.M. no. 97. 10. 1. 67.)

93. 5. 2. 2–3. Zomba, Nyasa (*Sir H. H. Johnston*).

97. 10. 1. 67. Zomba, Nyasa (*Sir H. H. Johnston*).

9. *Mungos sanguineus*, Rüpp.

1835. *Herpestes sanguineus*, Rüppell, N. Wirb. Abyss. p. 27.

This form has hitherto been accepted as a species distinct from *M. gracilis*. The Natural History Museum has no specimen from Kordofan, the type locality of *M. sanguineus*, but a specimen from the hills near Suakim can, I believe, be nothing but a form intermediate between *M. gracilis* and *sanguineus*. It is very pale in general colour and the tail-tip is half chocolate-brown and half black. There is a cotype of *M. gracilis* in the collection, and comparing these two specimens with Rüppell's plate of *M. sanguineus* and *gracilis*, the Suakim individual resembles the figure of *M. sanguineus* quite as much as (if not rather more than) the cotype agrees with that of *M. gracilis*. In the dimensions recorded by Rüppell there is

practically no difference between those of these two forms. I have no skull of either typical *M. sanguineus* or even of the Suakim form which I believe to be closely allied to it. Rüppell gives figures of skulls of *M. sanguineus* and *gracilis*, and at first sight the emargination of the lambdoid crest (which he particularly notices in the letterpress) and the almost complete absence of a postorbital constriction in the former seem to point to a fundamental difference in skull-shape between the two forms. An examination of the long series of skulls in the Natural History Museum shows, however, that in this group both these characters merely indicate immaturity. I think I am justified in concluding that *M. sanguineus* and *gracilis* cannot be specifically separated; and as *M. sanguineus* is the earlier name that form must be accepted as the typical one of this group, which extends through the length and breadth of Africa, with no variation other than of size and colour.

I follow Rüppell in describing *M. sanguineus* as "reddish isabella colour, grizzled with chestnut and with a rust-red tail-tip." Rüppell's dimensions are based on a quite young individual, and I offer the following (based on adult *M. gracilis* and the Suakim specimen) as probably those of a normal specimen:—

Head and body 300 mm.; tail 325; hind foot 58.

Hab. Type locality Kordofan.

(?) 6. 10. 2. 9. Erkowit, Suakim (*Mr. A. L. Butler*).

10. *Mungos sanguineus gracilis*, Rüpp.

1835. *Herpestes gracilis*, Rüppell, N. Wirb. Abyss. p. 29.

1847. *Herpestes Galinieri*, Guérin & Ferret, Galinier, Voy. Abyss. Atlas, Zool. pl. i.

1850. *Herpestes Lefebvrei*, Desmurs & Prévost, Lefebvre Voy. Abyss. Atlas, Zool. pl. i.*

1855. *Herpestes ochromelas*, Pucheran, Rev. Zool. vii. p. 393.

1861. *Herpestes iodoprymnus*, Heuglin, Nov. Act. Ac. Leop. xxix. p. 63.

1861. *Herpestes adailensis*, Heuglin, Peterm. Geog. Mitth. p. 17.

Rüppell describes the colour of his type as "cinereo flavicans" and "gelb grau," but I think the term "pinkish drab" used in my key gives a much better idea both of a cotype in the collection and of the animal represented in Rüppell's plate. Rüppell's description is evidently based on a young individual and the cotype mentioned above is also

* This is the name given in the index to the Atlas, but at the foot of the plate itself is printed "*Herpestes gracilis*."

young. The proportionally long tail is specially mentioned by Rüppell.

Dimensions :—

Head and body 300 mm. ; tail 340 ; hind foot 58.

Skull : condylo-basal length 62 ; basilar length 37 ; zygomatic breadth 32 ; palate breadth across p^4 20 ; length $c-m^1$ 21.5.

Hab. Type locality near Massowa, Abyssinia. (Cotype, B.M. no. 163 a.)

69. 10. 24. 11. . Soaroo, Abyssinia (*W. T. Blanford*).

69. 10. 24. 13. Adigrat, Tigre, Abyssinia (*W. T. Blanford*).

69. 2. 2. 6. Abyssinia. Purchased.

6. 11. 1. 17. L. Zuai, Abyssinia (*Zaphiro, H. N. McMillan*).

Herpestes Galinieri is from the figure plainly a very young *M. gracilis*. Mr. Thomas has quite recently made a special examination of all the specimens in the Paris Museum and assures me that the animal figured by Desmurs and Prévost as *H. gracilis*, on which both the names *Lefebvrei* and *ochromelas* were based, is a pale example of *M. s. gracilis*, in spite of the resemblance that the figure bears to *M. ochraceus*.

11. *Mungos sanguineus mutzigella*, Rüpp.

1835. *Herpestes mutzigella*, Rüppell, N. Wirb. Abyss. p. 29.

1839. *Ichneumia nigricaudatus*, Geoffroy, Mag. Zool. p. 18.

1877. *Herpestes mutscheltschela*, Heuglin, Reis. N.O.-Afr. p. 43.

Rüppell defines *M. mutzigella* as "blackish umber-brown." There is considerable individual variation in the extent to which the body-hairs are annulated. In a cotype from near Masowa all annulation is completely absent, while in a specimen from Erythræa almost all the hairs are annulated, though very coarsely. In all cases, however, it would seem that annulation of the hairs is absent on the tail. The form is rather larger than typical *M. sanguineus* and has a rather markedly short tail.

Dimensions as follows :—

Head and body 350 mm. ; tail 320 ; hind foot 62.

Skull : condylo-basal length 65 ; basilar length 60 ; zygomatic breadth 34 ; palate breadth across p^4 21 ; length $c-m^1$ 23.

Hab. Type locality Dembea and Simen Dists., Abyssinia. (Cotype, B.M. no. 164 a.)

46. 6. 15. 37. Abyssinia.

69. 10. 24. 12. Adigrat, Tigre, Abyssinia (W. T. Blanford).

3. 12. 5. 2-3. Chadi Saati, Erythræa (Schrader).

12. *Mungos sanguineus proteus*, Thos.

1907. *Mungos gracilis proteus*, Thos. Ann. & Mag. Nat. Hist. xix. p. 119.

A very variable form, much subject to melanism. Mr. Thomas describes the colour as ranging from "grizzled tawny ochraceous" to "blackish bistre."

The recorded dimensions are:—

Head and body 306 mm.; tail 260; hind foot 59; ear 25.

Skull: condylo-basal length 61; basilar length 56; zygomatic breadth 30·5; palate breadth across p^4 19·5; length $c-m^1$ 21·7.

Hab. Type locality Ruwenzori. (Type, B.M. no. 6. 12. 4. 35.)

6. 12. 4. 31-36. Ruwenzori.

13. *Mungos sanguineus ibea*, subsp. n.

Size about as in *M. s. mutigella*; general colour "olive-buff." Hairs of back 15-20 mm. long, black, with subbasal and subterminal rings bright buff, each 2-3 mm. wide; grizzling of back, as in all the preceding forms, tending to assume transverse dark stripes on hinder back and flank; head and feet more finely, tail more coarsely grizzled; hairs of latter, 25-30 mm. long, each with three or four buff rings.

Skull distinctly longer than in any of the preceding forms, the extra length almost wholly behind postorbital constriction.

Dimensions of the type specimen:—

Head and body 330 mm.; tail 300; hind foot 60; ear 26.

Skull: condylo-basal length 67; basilar length 62; zygomatic breadth 35; palate breadth across p^4 22; length $c-m^1$ 23·5.

Hab. Kikuyu, British East Africa. (Type, adult ♀, B.M. no. 4. 12. 6. 7. Collected by S. L. Hinde, Esq., at Fort Hall, British East Africa.)

Like the other forms it seems that *M. s. ibea* has a tendency to melanism, though much less so than in *M. s. mutigella* or *s. proteus*. Of the two specimens taken at the same place by Mr. Crawshay, one is quite normal; in the other the width of the buff rings is much reduced everywhere, while on the face and along the median dorsal line they are absent.

92. 12. 3. 6. Machakos (*F. J. Jackson*).
 0. 3. 27. 11. Lé, Galaland (*Lord Delamere*).
 0. 5. 3. 1-2. Roromo, Kikuyu (*R. Crawshaw*).
 0. 6. 21. 8. British East Africa (*Lord Delamere*).
 2. 7. 6. 13. Fort Hall, B.E.A. (*S. L. Hinde*).
 3. 4. 4. 1. Fort Hall, B.E.A. (*S. L. Hinde*).
 3. 11. 1. 2. Fort Hall, B.E.A. (*S. L. Hinde*).
 4. 2. 5. 3-4. Fort Hall, B.E.A. (*S. L. Hinde*).
 4. 11. 5. 11-12. Fort Hall, B.E.A. (*R. Meinertzhagen*).

14. *Mungos Granti*, Gray.

1864. *Herpestes Granti*, Gray, P. Z. S. p. 561.

1894. *Herpestes Neumanni*, Matschie, SB. Ges. naturf. Fr. Berl. p. 121.

Matschie's *M. Neumanni* is from Ugogo, and is therefore a topotype of *Granti*, Gray, and a comparison of Gray's type with Prof. Matschie's description of *M. Neumanni* shows that without doubt they are the same form.

General colour ochraceous, all the hairs on the median line from nose to tail tipped with tawny; tip of tail chestnut.

Dimensions:—

Head and body (circ.) 320 mm.; tail (circ.) 270; hind foot 58; ear 25.

Skull: condylo-basal length 63; basilar length 58; zygomatic breadth 30; palate breadth across p^4 21.5; length $c-m^1$ 22.

Hab. Type locality Mgunda Mkali. (B.M. no. 63.7.7.18, *Capt. Speke*.)

15. *Mungos ratlamuchi*, Sm.

1836. *Ichneumon ratlamuchi*, Smith, App. Rep. Exp. C. Afr. p. 42.

1838. *Herpestes badius*, Smith, Ill. Zool. S. Afr. pl. iv.

"Above chestnut, deepest on the head, neck, and tail; the hair of the back ringed with dull yellow, that of first half of tail with brown and yellow; tip of tail deep black." This is Smith's description of *M. ratlamuchi*. In his description of *M. badius* he substitutes "bright bay" for "chestnut," and mentions the black annulations of the hairs of the head and neck which cause the deepening of colour noted in his first description. Both descriptions apply to the type specimen in the Museum Collection.

Dimensions:—

Head and body 300 mm.; tail 290; hind foot 58; ear 25.

Skull: condylo-basal length 63; basilar length 58; zygomatic

matic breadth 33; palate breadth across p^4 20.5; length $c-m^1$ 21.5.

Hab. Type locality (of *M. ratlamuchi*) "between Latakoo and the Tropic"; (of *M. badius*) "between Old Latakoo and Karichane, 120 miles eastward." (Type, B.M. no. 46.6.1.14.)

16. *Mungos Cauii*, Sm.

1836. *Ichneumon Cauii*, Smith, App. Rep. Exp. C. Afr. p. 42.

1849. *Herpestes punctulatus*, Gray, P. Z. S. p. 11.

1852. *Herpestes ornatus*, Peters, Reise Moss. p. 117.

1864. *Calogale venatica*, Gray, P. Z. S. p. 563.

I have been able to examine about 40 specimens from localities spread over 10° of longitude and 15° of latitude, and I have to confess that I cannot differentiate any of them as even racially distinct from the rest. It is true that a series from Matabeleland is on the average paler than the rest, as a series from Mashonaland and the Zambesi basin is somewhat redder, but single individuals could be picked from other localities which are quite as pale or as red. It is to be regretted that Smith's name *Cauii* is the oldest, it was given to a young specimen from the neighbourhood of the Kalahari Desert, a quite extreme example of the pale desert type. Peters's *M. ornatus* is also based on a quite young specimen* of a darker redder type, while *M. punctulatus*, Gray, undoubtedly represents the normal form.

The general colour is hard to describe, it is some shade of drab tinged with greenish, having in all cases a greater or less suffusion of reddish on the loins and rump.

Dimensions:—

Head and body 300 mm.; tail 275; hind foot 58; ear 25.

Skull: condylo-basal length 65; basilar length 60; zygomatic breadth 33-35; palate breadth across p^4 20-23; length $c-m^1$ 22.

Hab. Type locality Currichaine (N.W. Transvaal).

45. 4. 4. 2. Durban, Natal. (Type of *H. punctulatus*, Gray.)

5. 3. 8. 13. Illovo, Natal (*Rudd Collection*).

4. 12. 3. 36-38. Umvalosi, Zululand (*Rudd Collection*).

4. 5. 1. 33-36. Etshowe, Zululand (*Rudd Collection*).

4. 9. 1. 32-34. Zuurbronn, E. Transvaal (*Rudd Collection*).

* Peters's figure of the skull of *M. ornatus* shows all the sutures which are only visible in youth. A specimen in the collection from the Zambesi not far from Tette, the type locality of *M. ornatus*, answers both in dimensions and colouring to Peters's description; it is quite young: an older specimen from the same locality is identical with other S. African individuals in dimensions and colour-pattern.

98. 4. 4. 13. Krugersdorp, West Transvaal (*H. P. Thomasset*).
 46. 6. 2. 23. Mohopau Berg, Bechuanaland.
 97. 1. 4. 1-4. Matabeleland (*F. C. Selous*).
 99. 2. 23. 1. Ngamiland (*Capt. Lugard*).
 93. 11. 21. 1. De Kaap (*Dr. P. Rendall*).
 6. 4. 3. 31-36. Woodbush, N.W. Transvaal (*Rudd Collection*).
 5. 12. 9. 19-20. Klein Letaba, N. Transvaal (*Rudd Collection*).
 6. 8. 2. 49. Legogot, N.E. Transvaal (*Rudd Collection*).
 6. 4. 7. 1. Sabi River, N.E. Transvaal (*J. S. Hamilton*).
 7. 3. 25. 4. Salisbury, Mashonaland (*Guy Marshall*).
 97. 1. 4. 5. Salisbury, Mashonaland (*F. C. Selous*).
 99. 8. 3. 4. Mashonaland (*Boyd Alexander*).
 7. 1. 11. 21. N. Rhodesia (*S. A. Neave*).
 1. 6. 26. 2. Pasa (*Col. Manning*).
 97. 10. 1. 66. L. Nyasa (*Sir H. Johnston*).
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XXII.—*The Name of the Armenian Wild Sheep.*

By R. LYDEKKER.

CONSIDERABLE diversity of usage prevails among naturalists with regard to the scientific name of the Armenian wild sheep, some writers adopting *Ovis Gmelini*, Blyth (1840), while others prefer *Ovis orientalis*. When the latter name is used the authority is generally given as G. F. Gmelin, 'Reise,' vol. iii. p. 486 (1784); but the animal is there referred to merely as "das orientalische Schafe," which is, of course, not a technical name. On the other hand, in Brandt and Ratzeburg's 'Getreue Darstellung und Beschreibung der Thiere, etc.,' Berlin, 1829, p. 54, pl. ix. fig. 1, we find the wild sheep of the "Ceraunian Mountains" of Persia described and figured as *Ovis musimon*, var. *orientalis*; and this name, modified to *O. orientalis*, consequently stands. It may be added that the work in question is really composed of extracts from 'Medizinische Zoologie,' a serial of which the first volume, containing the name in question, appears to have been published in 1827.

As to the "Ceraunian Mountains" of Persia, I take it that this must be an application of the name in a sense analogous to that in which the term "Alps" is often used, seeing that the Ceraunian or Acroceraunian Mountains are

in Albania. It probably refers to the south side of the Elburz range.

To the sheep of this locality I have given (1905) the name *Ovis Gmelini Erskinei*, but this will now have to give way to *O. orientalis typica*, while the Armenian race will have to be called *O. orientalis Gmelini*, Blyth's specimens having come from Erzerum.

XXIII.—*Descriptions and Records of Bees*.—XVI.

By T. D. A. COCKERELL, University of Colorado.

Osmia Bennettæ, sp. n.

♂.—Length about 9 mm.

Very brilliant, shining, *Augochlora*-green, with coppery and golden tints on the face and mesothorax, and a certain amount of golden lustre on the abdomen; antennæ entirely black, not moniliform; clypeus with long white hair; hair of front, vertex, and thorax above yellowish white or pale yellowish, *without any admixture of dark hairs* except a very few about the ocelli; tegulæ brilliant green. Wings clear, the apical margin a little dusky. Legs green, with mostly pale hair, but some dark, *e. g.* the middle tibia has dark hairs intermixed, and the middle basitarsus has much black hair. Dorsal hair of abdomen partly light and partly black, the black prevailing posteriorly; apex of sixth segment very feebly notched; seventh bidentate; venter with strong blue or purple tints.

From *O. gaudiosa*, Ckll., this is easily known by its larger size and the conspicuous black hair of the hinder part of the abdomen. The size and green tegulæ suggest affinity with *O. Bruneri*, Ckll., but I do not think it can be the male of that insect, the colour of the pubescence being so entirely different. The quite different colour of the tegument is not so important, as that may differ sexually in *Osmia*, *e. g.* in *O. versicolor*, Latr. From *O. bella*, Cress., it is readily known by the absence of dark hair on the thorax above. The width of the abdomen is 3 mm., thus much broader than *O. fulgida*, Cress.

Hab. Campus of University of Colorado, Boulder, Colorado, at flowers of *Taraxacum taraxacum*, May 8, 1907 (*Mrs. C. Bennett*).

Osmia Ednæ, sp. n.

♀.—Length about 7 mm.

Very brilliant golden-green, a little reddish on second abdominal segment; hair of head and thorax above long, pale ochraceous, with no dark hairs intermixed; on clypeus the hair is yellowish white; flagellum ferruginous beneath, not moniliform; mesothorax densely rugoso-punctate; tegulae brilliant green. Wings dusky hyaline. Legs green, with yellowish-white hair; hind femora almost black behind. Abdomen subglobose, with the hair *entirely pale yellowish or yellowish white*; sixth segment with a minute feeble notch; seventh strongly notched rather than bidentate.

Hab. Campus of University of Colorado, Boulder, Colorado, at flowers of *Taraxacum taraxacum*, May 9, 1907 (*Miss Edna Baker*).

The following table separates this species from some other bright green males:—

| | |
|--|-------------------------|
| Posterior part of abdomen dorsally with some or much black hair; size larger | 1. |
| Posterior part of abdomen dorsally with wholly light hair; size smaller | 2. |
| 1. Hair of thorax above with some dark hairs intermixed | <i>bella</i> , Cresson. |
| Hair of thorax above without dark hairs intermixed. | <i>Bennetta</i> , Ckll. |
| 2. Size smaller; pubescence white; abdomen dullish, not shining golden | <i>gaudiosa</i> , Ckll. |
| Size larger; pubescence very yellow; abdomen brilliant, shining golden | <i>Ednæ</i> , Ckll. |

Osmia leonis, sp. n.

♀.—Length about 11½ mm.

Head and thorax partly dark green, partly black; abdomen shining dark blue; legs black; ventral scopa black; cheeks normal. Head ordinary, with large strong punctures; mandibles tridentate, the apical tooth long and falciform, the second triangular and sharp, the third a long undulating ridge; anterior part of clypeus purple-black, this colour extending also up the middle; edge of clypeus straight, but at the middle next to the edge there is a *transversely oval shining pit of quite large size*; supraclypeal region with a shining green mark like an inverted V; antennae entirely black, comparatively short. Hair of clypeus, lower sides of face, and cheeks black; of front black and pale ochreous mixed; of vertex mostly black, but of occiput pale ochreous, extending forward over ocelli; hair of pleura black, but of

thorax above light ochreous, with black hair sparsely intermixed on scutellum and hind part of mesothorax; tegulæ black. Wings clear in the middle, but with the hind margin broadly and very distinctly infuscated; a very dark streak in upper part of marginal cell. Hair of legs black, dark reddish on inner side of tarsi. Abdomen short and convex, shining dark blue, with slight crimson or purple tints on second and third segments: hair of first segment pale except at extreme sides; of second black at extreme base, at sides, and apex, but long and pale on disk; remaining segments with black hair.

In my table of Boulder County *Osmia* (Univ. of Colo. Studies, ined.) this runs to *O. nigrifrons* and *O. gaillardie*, resembling the latter in superficial appearance (especially the shining abdomen), but differing in the colour of the pubescence, the clypeal pit, &c. The second r. n. joins the second s.m. nearer its end in *gaillardie* than in *leonis*. In *gaillardie* the little brushes of hair from beneath the clypeus are yellow; in *leonis* they are pure black. From *nigrifrons* the new species is more easily separated; among other things the punctures of the face are finer and smaller in *nigrifrons* than in *leonis*. There is evident affinity with *O. juxta*, Cresson, but the admixture of black hair on the thorax above and the light hair on second abdominal segment, as well as the clypeal pit, should suffice to distinguish *leonis* from that insect.

Hab. Campus of University of Colorado, Boulder, Colorado, at flowers of *Taraxacum taraxacum*, May 8 (*Edna Baker*).

On the hair of the abdomen were some mites of the genus *Trichotarsus*, which Mr. N. Banks says are *T. osmiæ*, Duf., or more probably a new species allied to it.

Osmia integrella, sp. n. (possibly *universitatis* var.)

♂.—Length 10 or 11 mm.

Steel-blue, with the head and thorax above, the first abdominal segment, and a strong tinge or suffusion on the apical part of the other segments green; hair long, the pale hair white, not ochreous, no admixture of black hair on head and thorax above, except that some black hair on upper part of cheeks has a few outlying hairs on extreme sides of vertex; cheeks with hair white, but some black behind and above. Antennæ black, flagellum not moniliform; clypeus normal; pleura with white hair except on posterior margin, starting with a patch just beneath wings, where it is black; extreme sides of metathorax with black hair; tegulæ green in front. Wings little dusky. Legs black, not at all metallic, their

hair largely black, but some pale on middle and hind femora, and long and mainly pale on anterior femora and tibiæ behind. First two abdominal segments with long white hair, some black at extreme sides of first segment, and short black hair along extreme base of second; third with mixed black and pale; the other segments nearly all black; in certain lights there is a strong suggestion of pale hair-bands; *sixth segment quite entire*; seventh with a pair of comparatively short teeth, wide apart; first ventral segment entire, third deeply emarginate, the emargination ciliate with reddish. *The second and third joints of middle tarsi have a strongly swollen or inflated appearance.* Third antennal joint shorter than fourth. Spurs normal.

This must be closely allied to *O. integra*, Cress., which I know only from the description; but it is smaller, the hair not (or barely) ochreous-tinted above, the legs apparently with more pale hair; the abdomen with more pale hair; and the fringe on middle of third ventral segment can hardly be said to be long and golden. Cresson also makes no allusion to any peculiarity of the middle tarsi of *integra*, though in the species described just before he describes and figures tarsal structures. It does not fit into any of the Robertsonian subgenera.

In my table of Boulder County species *O. integrella* runs nearest to *O. viridior*, or, perhaps, to *cyaneonitens*. The three are readily separated thus:—

| | |
|---|----------------------|
| Larger; hair on anterior tibiæ behind dense, rather short, and wholly black, contrasting with the long white hair on their femora behind..... | <i>viridior.</i> |
| Smaller; hair on anterior tibiæ behind long and mainly white | <i>integrella.</i> |
| Size about as in <i>integrella</i> , but very different by the dark purple-blue abdomen, without conspicuous light hair, much larger head and broader face, notched sixth segment, &c. | <i>cyaneonitens.</i> |

The face of *integrella* is rather unusually narrow, the eyes converging below, and is densely covered with white hair.

O. universitatis, Ckll., has the same type of coloration and the same sort of middle tarsi as *integrella*; but it is smaller than the latter and has not the conspicuous black hair on the sides of the thorax posteriorly or on the cheeks. In *universitatis* the middle femora and tibiæ have the hair behind brilliant white, with some black intermixed; in *integrella* this hair is black, with a few glittering white hairs. The two are obviously of the same immediate group, but apparently not varieties of a single species.

The stipes of *O. integrella* are divided at the end into a brush of black hairs and a divergent long, linear, corneous process.

Hab. Campus of University of Colorado, Boulder, Colorado, at flowers of *Taraxacum taraxacum*, May 8 (*Edna Baker*).

Osmia Ramaleyi, sp. n.

♂.—Length about $7\frac{1}{2}$ mm.

Head olive-green, the front almost golden; thorax above yellowish green, at sides bluish green; the metathorax blue, contrasting with the green scutellum and postscutellum. Abdomen a sort of Prussian green or greenish blue. Legs greenish blue, but the anterior legs black in front; tegulæ green. Wings clear, with only a very faint duskiness, the hind margin no darker than the rest. Hair of head and thorax long and white (not ochreous above), very dense on face; no dark hairs anywhere; hair of legs white, fulvous on inner side of tarsi; middle tarsi rather long, slender, the joints normal. Antennæ black, the flagellum not moniliform; third joint shorter than fourth. Abdomen rather coarsely sculptured; hind margins of segments concolorous with the rest; sixth segment with a broad, very shallow emargination; seventh strongly bidentate; first ventral truncate. Hair on abdomen above white, without any black.

In the table of Boulder County species this runs to *O. proxima*, Cresson, which is, however, much smaller and otherwise different. There is a good deal of resemblance to *O. atriventris*, Cress., but the green tegulæ and the structure of the sixth abdominal segment are distinctive. *O. Wheeleri* has the legs much less metallic, the tegulæ reddish in the middle, and, especially, the teeth of the seventh abdominal segment very much larger and triangular.

Hab. Campus of University of Colorado, Boulder, Colorado, at flowers of *Taraxacum taraxacum*, May 10 (*Edna Baker*).

Named after Professor Francis Ramaley, of the University of Colorado, in recognition of his work on the natural history of Colorado.

Since the above was written, on May 21, Mrs. C. Bennett has taken at Boulder 2 ♀ and 1 ♂ of *O. Ramaleyi*, all at flowers of *Astragalus goniatus*, Nuttall. The male is exactly like the type, except that the first ventral segment is very distinctly emarginate. This character is considered by Robertson to be of generic value, but after minutely comparing every part of the two bees I am sure that they are of the same species. The female has an orange scopa and is

almost exactly like *O. hypochrysea Rohweri*, Ckll., except that the clypeus is quite normal (not quadridentate) and the disk of the mesothorax is very much more densely punctured. The legs are blue.

This certainly belongs to the subgenus *Xanthosmia*, but it is not Robertson's *X. cordata*, being much smaller, with the third antennal joint in the male nearly as long as the fourth.

O. iridis from New Mexico, which also has the first ventral segment (♂) emarginate, is easily separated from *O. Kumaleyi* by its larger size and the character of the hair on the abdomen.

Osmia olivacea, Ckll.

This was described from a male, but Mrs. C. Bennett has taken a female at Boulder, May 21, 1907, at flowers of *Astragalus goniatus*. It is a remarkably fine insect, coloured like the male, but nearly 12 mm. long, very robust, the ventral scopa black; coarse black hair on the clypeus, but pale ochreous on sides of face, and these colours mixed on front; hair of thorax above as in male; hair of pleura pale ochreous, rather scanty; clypeus normal; mandibles tridentate, but the inner tooth broad and notched; legs black, not metallic. The abdomen is a very beautiful deep olivaceous green, with some slight crimson stains.

Also at the *Astragalus goniatus*, on the same day, Mrs. Bennett took two females of *Osmia nigrifrons*, Cresson, variety, and one of *O. coloradella*, Ckll.

Calioxys Porterae, Ckll.

Mr. N. Banks sends me a ♀ of this New Mexico species, which he took at Falls Church, Virginia, July 21—a most unexpected extension of range.

Melissodes Boltoniae, Robertson.

Falls Church, Virginia, August and September (*N. Banks*).

Very like *M. perplexa*, but smaller. Differs from *M. illata* by the smaller average size, band on middle of second abdominal segment entire or almost, and tuft on end of hind femora pale.

Melissodes manipularis, Smith.

Falls Church, Virginia, 2 ♂, one from flowers of *Eupatorium*, Sept. 4 (*N. Banks*).

Much like *M. trinodis*, but differs by the black hair on

middle of thorax above. Smith does not mention this hair, but I have examined his type.

Melissodes nivea, Robertson.

Falls Church, Virginia, 4 ♂, Sept. 4 and 8 (*N. Banks*).

Andrena nigræ, Robertson.

Boulder, Colorado (*Rohwer*).

New to Colorado. At Boulder, on May 22, 1907, Mr. Rohwer took females of three species of *Andrena*, all having red abdomens, at the flowers of *Salix luteosericea*, Rydberg. These, upon examination, prove to be *A. nigræ*, Robertson, *A. Mariæ*, Robertson, and *A. erythrogastra* (Ashmead). The known range of *nigræ* is extended about 800 miles westward.

Andrena saccharina, sp. n., Cockerell and Rohwer.

♂.—Length about 8 mm.

Black, with greyish-white hair, not nearly dense enough on thorax above to hide the surface. Head rather large, quadrate, facial quadrangle much broader than long; front with coarse vertical striæ; cheeks broad, with the rounded posterior angle a little above level of middle of eye. Antennæ long, third joint longer than fourth, but a trifle shorter than 4+5; flagellum very obscurely brownish beneath, the middle joints longer than broad. Mandibles strongly grooved, bidentate, the apex reddish; process of labrum broadly rounded, not at all emarginate; *malar space large and shining*; *clypeus much produced, mainly light yellow*, with strong but very sparse punctures; the yellow is invaded by black above and below, so that its lower margin is convex (the apical margin of clypeus being black) and its upper part is notched above and deeply on each side; mesothorax and scutellum dull, minutely tessellate, with sparse feeble punctures; area of metathorax merely roughened, scarcely defined; tegulæ dark in front, shining brown behind. Wings yellowish, iridescent, stigma (of normal size) and nervures ferruginous; second s.m. narrow, receiving the r. n. near its middle. Legs black, with light hair. Abdomen with a sericeous surface, not punctured, the hind margins of the segments obscurely reddish, and with very thin, not conspicuous, bands of white hair.

On account of the produced clypeus and large malar space this is related to *A. leptanthi*, V. & C., but it is a very distinct

species. It was given to me by Mr. S. A. Rohwer, who had already studied it and determined that it was new.

Hab. Sugar Loaf Mountain, Boulder County, Colorado, 8500 ft., May 18, 1907, at flowers of *Arctostaphylos uva-ursi*. Collected by Miss Edna Baker.

Perdita quadrangularis, sp. n.

♂.—Length 4 mm.

In my tables of *Perdita* runs to *P. sphaeralceæ*, of which it looks like a small edition. From *P. erigeronis* it is easily known by the pallid nervures and the coloration of the abdomen. The face-markings are of a chrome-yellow instead of lemon-yellow, but otherwise agree, as do all the other markings of the head, with *sphaeralceæ*. The face below the antennæ is all yellow, the lateral marks being large and quadrangular, ending on the orbital margin at an angle of about 45°. Antennæ chrome-yellow, the first four or five joints black-spotted above. Thorax, legs, and wings essentially as in *sphaeralceæ*, but margin of stigma yellowish. Abdomen with the venter yellow, as in *sphaeralceæ*, but on the dorsum the dark colour is reduced, the general effect being that of equally broad light and dark bands, with the apical segments a sort of yellowish ferruginous. The thorax has much white hair.

Hab. Alamogordo, New Mexico, May 15, about eighty-five specimens (*H. L. Viereck*).

P. sphaeralceæ does not appear on the wing until long after midsummer.

Perdita Vierecki, sp. n.

The female runs in the tables of *Perdita* to male *P. tarda*, the male to *P. exclamans*. Both sexes were taken in large numbers; otherwise one would suspect the insect to be a variety of *P. exclamans*, to which it is very closely allied.

♀.—Length about 4½ mm.

Differing from *exclamans* as follows:—Size smaller; abdomen above piceous, with the yellow markings reduced to a variable series of spots occupying the middle of the segments; thus the first segment may have a pair of dots or no light marks at all; the second may have a large quadrangular pale yellow patch or a yellow band on the middle third; the third segment, and also the fourth, may be more or less banded, the band in no case approaching the lateral margin; or the fourth and fifth may each have a couple of spots; thus the abdominal markings are extremely variable,

but in all cases the colour is very different from that of *exclamans*, which has broad yellow bands, mostly reaching the lateral margins.

♂.—Essentially as in *exclamans*, but the head-like extension of the yellow above the antennæ in middle line is much smaller, and the yellow patch on the pleura does not send a band to the middle coxæ.

Hub. Alamogordo, New Mexico, April 26 to May 15, about 110 specimens (*H. L. Viereck*).

Although this series is manifestly distinct from *P. exclamans*, some of the specimens show more or less evident transitional characters, suggesting that the insect should perhaps take only subspecific rank. This is one of those cases, of which we now know several in *Perdita*, which promise to yield facts of extreme interest to the evolutionist when carefully studied in the field.

Perdita phaceliæ, Ckll.

Alamogordo, New Mexico, May 13 and 15 and June 6, 33 specimens (*H. L. Viereck*).

I have compared the Alamogordo specimens with cotypes of *phaceliæ* and cannot see any difference. The latter, however, were taken early in September. Are we to suppose that this species winters over in the adult state, or is it double-brooded? The small size and dull mesothorax readily separate this from *P. æneifrons*.

Perdita pectidis, Ckll.

This also has been known as an autumn species, flying in September. Mr. Viereck took at Alamogordo, April 24 and May 3, a series of about 65 specimens, which exhibit much variation, but do not seem to be separable from *P. pectidis*.

In the female the clypeus may be three-spotted or may lack the middle spot, and even the lateral spots may be very small. The banding of the abdomen varies from a couple of dots only to well-developed bands. In general, however, the insect agrees excellently with *pectidis*, and I do not think it possible to regard it as distinct.

Perdita chamæsarachæ, Ckll.

Highrolls, New Mexico, June 11, 1902 (*H. L. Viereck*). This species was found flying at Albuquerque and Santa Fé in August.

Perdita Rehni, sp. n.

♀.—Length about $4\frac{1}{2}$ mm.

In the table of New Mexico *Perdita* runs to *P. pallidior*, but is easily distinguished from that species by the smaller size, much darker abdomen, colour of antennæ, &c. Head and thorax yellowish green, the mesothorax dullish (not brilliantly polished, as it is in many species); head small; front shining green; clypeus and supraclypeal area purplish black; the only pale face-marks are the small L-shaped pale yellowish lateral marks, which send a very fine broken line up the orbital margin to a little above level of antennæ. Mandibles whitish; cheeks dark, with white hair. Antennæ dark above, pale yellowish beneath, the dark more prominent than the light; border of prothorax and tubercles light yellow; pleura all dark. Anterior legs entirely light yellow, or the femora may have a brown patch, and the tibiæ a line, behind; middle femora all light yellow, but the tibiæ mainly brown on outer side and the tarsi somewhat darkened; hind femora with the apical half above dark brown and their tibiæ and tarsi brown; nervures colourless, but stigma margined with brown; marginal cell with the substigmal portion much the longest; third discoidal distinct. Abdomen above dark brown, the first segment with a transverse light yellow discal mark; segments 2 to 4 each with a basal light yellow band, but the bands on 3 and 4 may be nearly concealed by the retraction of the segments, giving the appearance of a one-banded abdomen; fifth segment, apex, and ventral surface reddish yellow. Sometimes the fifth segment has a very broad yellow band on a dark ground, or it may be all dark.

Hab. Alamogordo, New Mexico, June 9, 1902 (*H. L. Viereck*).

Named after Mr. Rehn, the well-known orthopterist and mammalogist, who was Mr. Viereck's companion on the 1902 expedition.

Prosopis Cressoni, n. n.

Prosopis pygmæa, Cresson, Proc. Boston Soc. Nat. Hist. xii. (1869) p. 272 (Illinois).—Not *P. pygmæa*, Schenck, 1853.

Nomada flavoguttata Alfkeni, n. n.

Nomada pygmæa, Schenck, Berlin. ent. Zeits. xviii. (1874) p. 342.—Not *N. pygmæa*, Cresson, 1863.

Megachile Grantiana, n. n.

Megachile punctatissima, W. F. Kirby, Bull. Liverp. Mus. iii. (1900) p. 20.—Not of Spinola, 1806.

Hab. Sokotra (*Ogilvie-Grant and Forbes*).

I informed Mr. Kirby of the preoccupation of the name proposed by him; but as he is no longer working on Hymenoptera, he asks me to rectify the matter.

Megachile paucipunctulata, W. F. Kirby.

Megachile paucipunctulata, W. F. Kirby, Bull. Liverp. Mus. iii. (1900) p. 21.—Sokotra.

N. syn.: *Megachile sokotrana*, Friese, Zeits. f. Hym. und Dipt. 1903, p. 287.—Sokotra (*Simony*).

Megachile subsericans, n. n.

Megachile vicina, Moraw. Horæ Soc. Ent. Ross. xxviii. (1894) p. 37.—Turkestan.—Not *M. vicina*, Mocsáry, 1879.

Megachile mixtula, n. n.

Megachile mixta, Radoszkowski, Bull. Soc. Nat. Moscou, xlvii. (1874) p. 138.—Caucasus.—Not *M. mixta*, Costa, 1863.

Boulder, Colorado, U.S.A.,
June 5, 1907.

XXIV.—*Notes on the American Species of Hesperiidæ described by Plötz.* By F. D. GODMAN, D.C.L., F.R.S., &c.

I HAVE recently had an opportunity of examining the large number of coloured drawings made by the late Carl Plötz, and am at last enabled to identify most of the Mexican and Central-American species described in his various writings. These drawings not only illustrate the numerous Hesperiidæ named by him, but nearly all those tabulated or described by Herrich-Schäffer and other continental authors, and they are therefore of the greatest interest to all students of Rhopalocera. The following notes on his figures of the American species, generally, give the necessary corrections to the synonymy, &c.* The numerals in parentheses after each name indicate the number of Plötz's drawings, and the locality

* Drawings nos. 1328-1333 are unfortunately missing, and one Central-American species, *Netrocoryne coronus*, Plötz, still remains unidentified by me.

is added either from the drawing or the published description. In a few cases the locality has not been recorded. Coloured copies of the figures of all the unidentified American species have been made and presented by me to the Natural History Museum at South Kensington.

| | |
|---|---|
| <i>Goniurus pilatus</i> , Plötz (2), Brazil and Guiana. | = <i>Eudamus simplicius</i> , Stoll. |
| „ <i>procne</i> , Plötz (3), Brazil. | = <i>Eudamus simplicius</i> , Stoll. |
| „ <i>zagorus</i> , Plötz (4), Allagras. | Probably a small form of <i>Eudamus eurycles</i> , Latr. |
| „ <i>zalanthus</i> , Plötz (5), Allagras. | = <i>Eudamus eurycles</i> , Latr. |
| „ <i>elongatus</i> , Plötz (8), Brazil. | Very near <i>Eudamus undulatus</i> , Hew., but with the outer dark band only present on the secondaries beneath. |
| „ <i>nicasius</i> , Plötz (9), Brazil. | = <i>Eudamus undulatus</i> , Hew. |
| <i>Eudamus flammula</i> , H.-S. (18), Loc.? | = <i>Eudamus lindora</i> , Butl. Herrich-Schäffer's name has priority. |
| <i>Goniurus procerus</i> , Plötz (21), Peru. | Belongs to <i>Eudamus</i> . Not in the G. & S. coll. |
| „ <i>celius</i> , Plötz (22), Pará. | Belongs to <i>Eudamus</i> . Not in the G. & S. coll. |
| „ <i>retractus</i> , Plötz (24), La Guayra. | The St. Vincent and Grenada insect recorded by G. & S. under the name <i>Eudamus santiago</i> , Luc., belongs to this species. |
| „ <i>larius</i> , Plötz (26), Cuba. | = <i>Eudamus santiago</i> , Luc. (= <i>corydon</i> , Butl.). |
| „ <i>velinus</i> , Plötz (27), Bahia. | Probably a var. of <i>Eudamus dorantes</i> , Stoll. |
| „ <i>galbulu</i> , Plötz (30), Brazil. | Belongs to <i>Eudamus</i> . From Colombia, Guiana, and Brazil in the G. & S. coll. |
| „ <i>Kefersteini</i> , Plötz (32), Caracas. | = <i>Eudamus dorantes</i> , Stoll. |
| „ <i>proteoides</i> , Plötz (33), N. Am. | = <i>Eudamus proteus</i> , L., var. with the hyaline spots on the primaries very small. Specimens from the Lesser Antilles in the G. & S. coll. |
| „ <i>ixion</i> , Plötz (36), Rio Janeiro. | = <i>Eudamus catillus</i> , Cr. |
| „ <i>herophilus</i> , Plötz (43), Rio Janeiro. | = <i>Eudamus virescens</i> , Mab. |
| „ <i>leucodesma</i> , Plötz (47), Pará. | = <i>Eudamus cholus</i> , Plötz. Description unpublished? |
| „ <i>hypozeonius</i> , Plötz (53), La Guayra. | = <i>Goniurus calvus</i> , Cr. |
| <i>Eudamus fulminans</i> , H.-S. (63), Loc.? | = <i>Thymele mephitis</i> , Hew. Herrich-Schäffer's name has priority. |
| „ <i>zopyrus</i> , Plötz (64), Surinam. | Probably belongs to <i>Thymele</i> . The markings are very similar to those of <i>Eudamus miltas</i> , G. & S. |

- Eudamus erycina*, Plötz (66), Unknown to me. ? Genus *Thymele*.
Brazil.
- „ *aulus*, Plötz (67), Brazil. ♂ = *Thymele enotrus*, Cr., ♀ = *T. fulviluna*, Mab.
- Telegonus granadensis*, Möschl. (70), = *Thymele aulestes*, Cr., var.
Venezuela.
- Eudamus bricinus*, Plötz (72), S. = *Thymele aulestes*, Cr., var.
Am.
- „ *passalus*, H.-S. (74), A *Goniurus*, near *talus*, Cr. Not
Loc. ? in G. & S. coll.
- „ *orphne*, Plötz (79), Rio A *Telegonus*, very near *T. eudamus*,
Janeiro. Mab., from Central America.
- „ *orpheus*, Plötz (80), Pará. A *Thymele*, very near *T. enotrus*,
Cr.
- „ *justus*, Plötz (81), S. Am. A *Thymele*, ♂, near *T. pervivax*,
Hübner.
- Telegonus bahianus*, H.-S. (83), A *Chrysospectrum*, probably a var.
Loc. ? of *otriades*, Hew. From San
Paulo in the G. & S. coll.
- „ *pseudochalybe*, H.-S. A close ally of the variable *T. cre-*
(87), Loc. ? *teus*, Cr.
- Eudamus Hopfferi*, Plötz (88), S. = *Telegonus creteus*, Cr., var.
Am.
- Telegonus cretellus*, H.-S. (89), Plötz's figures appear to represent
Loc. ? two species: the lower one
agrees with *T. jaira*, Butl.,
the upper one being very
like *T. chiriguensis*, Staud.
Herrich-Schäffer's name has
priority.
- Eudamus xagua*, Luc. (90), Cuba. The identity of this species with
Goniloba malefida, H.-S., was
noted by Plötz.
- „ *blasius*, Plötz (93), Cuba. = *Telegonus elorus*, Hew.
- „ *latimargo*, H.-S. (94), = *Telegonus grullus*, Mab. Herrich-
Loc. ? Schäffer's name has priority.
- „ *albicuspis*, H.-S. (95), A *Thymele* (?), near *phalæcus*,
Loc. ? G. & S.
- „ *Gundlachi*, Plötz (99), A form of *Proteides idas*, Cr., very
Porto Rico. near *Angasi*, G. & S., but
without the subapical spots.
- „ *clavicornis*, H.-S. (100), = *Epargyreus exadeus*, Cr.
Loc. ?
- „ *panthius*, H.-S. (109), = *Epargyreus asander*, Hew., var.
Loc. ?
- „ *rochus*, Plötz (116), = *Epargyreus enispe*, Hew., var.
Brazil. with the subapical spots
wanting.
- „ *scheba*, Plötz (117), S. Very near *Epargyreus asander*,
Am. Hew., but with a straight
white band on the secondaries
beneath.
- „ *chersis*, H.-S. (118), Loc. ? = *Æchydrus evelinda*, Butl. Her-
rich-Schäffer's name has
priority.
- „ *philius*, Plötz (124), Brazil. Belongs to *Cogia* (?), near *cajeta*,
H.-S.

- Eudamus cajeta*, H.-S. (128), Loc. ? Plötz's figure does not quite agree with the insect identified as *Cogia cajeta*, H.-S., in the 'Biologia.'
- „ *valeriana* (*valerius*), Plötz (130), Mexico. Belongs to *Cogia*, near *cajeta*, H.-S.
- „ *nicomedes*, Plötz (133), Brazil. Belongs to *Telemiades*, near *megallus*, Mab.
- „ *jalapus*, Plötz (134), Mexico. A *Rhabdoides*, near *casica*, H.-S.
- „ *casica*, H.-S. (135), Loc. ? = *Rhabdoides epigena*, Butl. Herich-Schäffler's name has priority.
- Proteides zethos*, Plötz (137), Pará. = *Telemiades amphion*, Hübn., var.
- „ *antiope*, Plötz (138), Pará. = *Telemiades amphion*, Hübn., var.
- „ *nicola*, Plötz (140), Pará. Belongs to *Cabares*(?), near *potrillo*, Luc.
- Telemiades vulpecula*, Plötz (145), S. Am. The type of the genus *Physalea*, Mab. Males from Colombia and Venezuela in G. & S. coll.
- Telegonus epicalus*, Hübn. (*arcturus*, H.-S.) (147), Loc. ? = *Telemiades phasias*, Hew. Hübner's name has priority. Plötz's figure was taken from a Brazilian specimen.
- „ *ceramina*, H.-S. (148), Loc. ? Plötz's figures represent the two sexes of a *Telemiades*, from Surinam, very near *T. littera*, Mab. The supposed type of *T. ceramina*, in the G. & S. coll., is a ♀ of *Lerema accius*, Smith and Abbot, as stated in the 'Biologia.'
- Netrocoryne seneca*, Plötz (160), Brazil. Possibly belongs to *Ardaris*. Not in the G. & S. coll.
- Eudamus porcius*, Feld. (161), Rio Negro. = ♂ and ♀, *Dyscophus doriscus*, Hew., and *Netrocoryne cactuensis*, H.-S. Felder's name has priority.
- Netrocoryne damias*, Plötz (162), S. Am. = *Bungalotis ramusis*, Cr., ♂.
- Telegonus gaurus*, Plötz (165), Rio Negro. = *Nascus euribates*, Cr., ♂, var.
- „ *fulvius*, Plötz (166), Cameta. = *Telegonus erythras*, Mab. There is a specimen of it from Villa Nova, Amazons, in the G. & S. coll. Mabilie refers the species to *Dyscophellus*. Plötz's name has priority.
- „ *probus*, Möschl. (168), Surinam. Genus ? Not in G. & S. coll.
- „ *cænosa* (H.-S.), Möschl. (169), Venezuela. = *Bungalotis phaselis*, Hew., ♂ ♀.
- „ *tychios*, Plötz (179), Bahia. Plötz's figures seem to represent vars. of *Bungalotis salatis*, Cr., ♀.
- „ *lucca*, Plötz (183), S. Am. Probably a var. of *Nascus cephisus*, Hew., ♀. A specimen of it

- Pellicia macarius*, H.-S. (191), Venezuela.
- „ *albangula*, H.-S. (192), Guatemala.
- „ *ephora*, H.-S. (193), S. and Centr. Am.
- „ *licisca*, Plötz (196), Nicaragua.
- „ *dimidiata*, H.-S. (*corinna*, Plötz) (199), Mexico.
- „ *theon*, Plötz (200), S. Am.
- „ *zamia*, Plötz (201), S. Am.
- „ *tyana*, Plötz (202), S. Paulo.
- „ *crispus*, H.-S. (204), Venezuela.
- Arteurotia demetrius*, Plötz (205), Brazil.
- Æthilla toxeus*, Plötz (212), Mexico.
- „ *nocera*, Plötz (213), Colombia.
- „ *primus*, Plötz (214), Brazil.
- „ *melas*, Plötz (216), Rio Janeiro.
- Cogia punctilia*, Plötz (222), Santarem.
- Cecropterus longipennis*, Plötz (227), S. Am.
- „ *koluthos*, Plötz (228), Colombia.
- „ *orontes*, Plötz (229), La Guayra.
- „ *lunulus*, Plötz (231), S. Am.
- „ *bocus*, Plötz (233), Pará.
- Lychnuchus* (*Papilio*) *hiarbas*, Cram. (242), S. Am.
- „ *clearchus*, Plötz (247), S. Am.
- from Santarem in the G. & S. coll.
- Plötz's figures (♂ ♀) do not agree with the insect identified under this name in the 'Biologia,' but belong to *P. castolus*, Hew.
- The specimen (♀) figured by Plötz is stated to be from "Rio," not Guatemala. The species cannot be satisfactorily identified.
- = *P. tiphys*, Godm. Herrich-Schäffer's name has priority.
- = *P. thyestis*, Godm., ♂. Plötz's name has priority.
- = *P. didia*, Möschl. Herrich-Schäffer's name has priority.
- Achlyodes nivonicus*, Plötz, is doubtless the female of the same species.
- Apparently not represented in the G. & S. coll.
- Apparently not represented in the G. & S. coll.
- Probably belongs to *Mycteris*, near *cærulea*, Mab. Specimen figured is a ♂.
- Probably belongs to *Mycteris*, near *cambyses*, Hew. Specimen figured is a ♂.
- Unknown to me.
- = *Murgaria albociliata*, Mab., but has darker cilia.
- There is a worn specimen of this species in the G. & S. coll.
- Also in G. & S. coll.
- Very like *Æ. echina*, Hew., but with the secondaries almost black beneath.
- A close ally of *C. calchas*, H.-S.
- = *C. aunus*, F., ♂.
- = *C. zentus*, Möschl., ♂. Occurs also in Venezuela.
- = *C. aunus*, F., ♀.
- = *C. neis*, Hübn., ♀, var.
- = *C. itylus*, Hübn., var.
- Plötz figures a *Lychnuchoides* (? *ozius*, Hew.) under this name. It is possible that Cramer's species has been correctly identified by him.
- This figure represents the insect identified as *Ancistrocampta*

- Sophista plinius*, Plötz (249), S. Am. Very near *S. aristoteles*, D. & H. There is a specimen of it from Novo Friburgo in the G. & S. coll.
- Hesperia paria*, Plötz (259), Chiriqui. = *Eutychide achelous*, Plötz, ♂. Specimen figured is from La Guayra, not Chiriqui.
- „ *ina*, Plötz (261), Chiriqui. = *Methionopsis modesta*, Godm. Plötz's name *ina* has priority.
- „ *insignis*, Plötz (262), La Guayra. = *Mnasitheus simplicissima*, H.-S.
- „ *infuscata*, Plötz (265), Brazil. This is not the species identified as *Papias infuscata*, Plötz, in the 'Biologia,' for which Mabilles's name *integer* can be used. *H. infuscata*, Plötz, has a brand formed of two narrow elongate streaks on the primaries in the ♂. It comes very near *Metiscus atheas*, Godm.
- Pamphila lurida*, H.-S. (266), Loc. ? Probably belongs to *Mnasitheus*. Specimen figured is from Brazil.
- Hesperia rubida*, Plötz (268), S. Am. Probably belongs to *Papias*.
- Cobalus derasa*, H.-S.* (269), Loc. ? Probably the ♀ of a species of *Papias*.
- Goniloba sandarac*, H.-S. (271), Cuba. = *Hesperia palæa*, Hew., Herrich-Schäffer's name having priority. Belongs to genus *Asbolis*, Mab.
- Hesperia depuncta*, Plötz (273), Rio Janeiro. = *Cobalus cinnamomea*, H.-S., the latter name having priority. Belongs to a genus near *Dion*. Numerous specimens in G. & S. coll.
- Cobalus tertianus*, H.-S. (274), Loc. ? Belongs to *Cobalus*. *Pamphila warra*, Möschl., is the ♂, and *P. zola*, Möschl., the ♀, of the same species.
- Hesperia crispinus*, Plötz (277), Mexico. Looks very like *Mnasicles geta*, Godm. The drawing of the underside is, perhaps, too highly coloured.
- „ *rivera*, Plötz (278), Rio Janeiro. Probably a *Mnasicles*.
- „ *bias*, Plötz (279), S. Am. Very like *Mnaseas bicolor*, Mab.

* Corresp.-Blatt Regensb. 1870, p. 159.

- Hesperia gabinus*, Plötz (280), Rio Janeiro. Genus? Two ♀ from Santa Catherina in the G. & S. coll.
- " *Hermioneri*, Latr. (281), Carolina. Plötz figures a Venezuelan specimen as this species.
- " *perlodes*, Plötz (282), Brazil. Very like the Mexican *Master anubis*, Godm.
- " *perla*, Plötz (283), Rio Janeiro. Not represented in the G. & S. coll.
- " *circellata*, Plötz (284), Brazil. Apparently not represented in the G. & S. coll.
- Pamphila subcostulata*, H.-S. (286), Brazil. Probably belongs to *Papias*. A ♂ from Iquitos in the G. & S. coll. may belong to it.
- Hesperia leucopogon*, Plötz (287), La Guayra. Apparently not represented in the G. & S. coll.
- " *antistia*, Plötz (290), Rio Janeiro. A *Cymenes* and probably a form of the species identified as *C. silius*, Latr., in the 'Biologia.' Plötz's figure of the latter represents a larger insect, very like an unnamed specimen from Chiriqui in the G. & S. coll.
- " *lycanoides*, Plötz (291), Rio Janeiro. A *Cymenes*, and perhaps a var. of *malitiosa*, H.-S.
- " *pruinosa*, Plötz (293), S. Am. Belongs near the genus *Dion*. There are two specimens of it from Chapada in the G. & S. coll.
- " *abdon*, Plötz (294), Brazil. Belongs to the genus *Zenida*, Mab. There are three specimens of it in the G. & S. coll.
- " *acraea*, Plötz (296), Colombia. Unknown to me.
- " *aon*, Plötz (300), Colombia. = *Lignystola lacydus*, Druce. Plötz's description does not seem to have been published.
- " *fimbriata*, Plötz (301), Mexico. Unknown to me.
- " *ochrope*, Plötz (311), Pará. = *Pyrrhopygopsis telmela*, Hew., var. with a small hyaline spot on the primaries exterior to the transverse fascia. Plötz's figure (310) of *P. telmela* is very like *P. cleantes*, Latr.
- Erycides apicalis*, H.-S. (313), Loc. ? = *Pyrrhopygopsis cleantes*, Latr., var. with the spots on the primaries very small.
- Hesperia peratha*, Plötz (315), Bahia. Probably a *Thracides*, near *luda*, Hew.
- " *nealces*, Plötz (316), Rio Janeiro. = *Thracides luda*, Hew., and *T. hundurensis*, Mab.
- " *alda*, Plötz (321), Brazil. A very close ally of *Themesion certima*, Hew. There is a ♀ of it from Santa Catherina in the G. & S. coll.

- Cobalus quadrata*, H.-S. (322),
Loc.? Belongs to genus *Tisias*. There is a ♂ of it from Minas Geraes in the G. & S. coll. exactly agreeing with Plötz's figure.
- Hesperia trimaculata*, Plötz (326),
Brazil. Probably a *Cobalus* near *gubina*, Godm. There is a ♂ of it from Minas Geraes in the G. & S. coll.
- „ *elisa*, Plötz (332), Brazil. = *H. crotona*, Hew. Genus near *Perichares*.
- „ *adjuncta*, Plötz (340),
Colombia. = *Talides sergestus*, Cr., ♂, dark var.
- „ *Besckei*, Plötz (348),
Novo Friburgo. = *Niconiades cydia*, Hew., var., ♂, with a broader white band on the secondaries beneath.
- „ *xanthotrix*, Plötz (352),
Rio Janeiro. Probably a var. of *Parades orchamus*, Cr., ♂. The *Phocides xanthotrix* of Mabille, from Bolivia, is perhaps a different species. Plötz's description has not apparently been published.
- „ *brinoides*, Möschl. (360),
Surinam. = *H. noseda*, Hew. Genus?
- „ *nanneta*, Plötz (370), Rio
Janeiro. Probably belongs to *Thracides*, near *cæsenæ*, Hew.
- „ *catochra (catochia)*, Plötz
(374), Mahrida. Incorrectly quoted amongst the unidentified Mexican species in the 'Biologia.' No doubt an eastern form.
- Goniloba matthiolus*, H.-S. (375),
Loc.? = *Thracides salius*, Cram., var. Plötz's figure is too green on the upperside.
- Hesperia pelora*, Plötz (384),
Brazil. Probably not the ♀ of *Cobalopsis edda*, Mab., as suggested in the 'Biologia.'
- „ *valentina*, Plötz (389),
Surinam. = *Carystoides basochesi*, Latr., var. with the three hyaline spots on the primaries reduced in size and the patch on the secondaries broken up into small spots.
- „ *replana*, Plötz (390),
Brazil. = *Carystoides basochesi*, Latr., var. with the hyaline patch on the secondaries reduced to two small spots.
- „ *socles*, Plötz (392), S.
Am. = *Vacerra litana*, Hew., var.
- „ *emacareus*, Plötz (393),
Venezuela. The insect identified as *Thespieus macareus*, H.-S., in the 'Biologia.'
- Goniloba macareus*, H.-S. (395),
Loc.? = *Thespieus othna*, Butl.
- Hesperia æas*, Plötz (400), Chiriqui.
„ *cubenta*, Plötz (401), S.
Am. = *Vacerra litana*, Hew., var. Probably a var. of *Vacerra litana*, Hew., with the white markings more extended beneath.

- Hesperia diores*, Plötz (407), S. Am. Very like *Carystus Claudianus*, Latr., but with the secondaries similarly marked above and beneath.
- „ *elana*, Plötz (409), Brazil. Comes near the genus *Pseudosarbia*, Berg. There are three males of it from Chapada in the G. & S. coll.
- „ *silanion*, Plötz (410), Bahia. Very like the ♀ of *Carystus hyaspes*, Cram., the type of Mabille's genus *Synale*. The single specimen (♀) in the G. & S. coll. has the head green above.
- „ *mitella*, Plötz (411), Brazil. A very close ally of *H. elana*, Plötz, and belonging to the same genus. Occurs at the same locality, Chapada, from which place there is a pair in the G. & S. coll.
- „ *jebus*, Plötz (412), Brazil. = *Zenis minos*, Latr.
- „ *melaleuca*, Plötz (413), Rio Janeiro. = *Zenis minos*, Latr., var.
- Cobalus dissoluta*, Plötz (416), Loc. ? = *Zenis calvina*, Hew.
- Hesperia ozeta*, Plötz (417), Bahia. = *Zenis ozeta*, Butl., var.
- „ *cinica*, Plötz (418), Pará. Probably a *Tirynthia*, near *conflua*, H.-S.
- Goniloba caniola*, H.-S. (419), Loc. ? = *Vacerra canente*, Butl. Herrich-Schäffer's name has priority.
- „ *conformis*, H.-S. (422), Loc. ? Probably a var. of *Prenes nero*, F.
- „ *luctuosa*, H.-S. (426), Loc. ? Belongs to *Prenes*, near *evadnes*, Cram., and *pauper*, Mab.
- Hesperia chlorus*, Plötz (428), Surinam. = *Prenes evadnes*, Cram., ♂.
- „ *zisa*, Plötz (430), Rio Janeiro. Probably an *Oxyntes*, near *corusca*, H.-S.
- „ *hypodesma*, Plötz (431), Pará, Rio Janeiro. A close ally of *Metron chrysogaster*, Butl.
- „ *cuneata*, Plötz (432), S. Am. = *Metron chrysogaster*, Butl., and *goza*, Hew.
- „ *hesiodes*, Plötz (434), "Cap Rico." = *Cobalus fidicula*, Hew. The locality quoted is a misprint for Costa Rica.
- „ *elvira*, Plötz (436), S. Am. Probably a *Vettius*, near *laurea*, Hew.
- „ *lyrcea*, Plötz (442), Brazil. = *Carystus marcus*, F.
- „ *eucherus*, Plötz (445), Surinam. = *Carystus fantasos*, Cram.
- „ *monacha*, Plötz (451), Blumenau. Belongs to *Vettius*, near *triangularis*, Hübn. Plötz's figure is taken from a Pará specimen.
- „ *peninsularis*, Plötz (452), Pará. Probably a *Vettius*, near *Lafresnayi*, Latr.
- „ *senev*, Plötz (459), Rio Janeiro. = *Paracarystus hypargyra*, H.-S., var.

- Hesperia rezia*, Plötz (466), Brazil. Genus? Probably a var. of *Hesperia almada*, Hew., with the lighter markings of the under-side wanting. *Carystus metanira*, Mab., is no doubt synonymous.
- „ *aquilina*, Plötz (473), Loc.? Perhaps an *Artines*, near *æpitus*, Hübn.
- Cobalus catocala*, H.-S. (485), Loc.? Plötz's drawing of this species shows that it is not the ♀ of *Megistias isus*, Godm.
- Hesperia distigma*, Plötz (488), Loc.? Very like *Eutychide cingulicornis*, H.-S., and probably American.
- „ *sabina*, Plötz (490), Novo Friburgo. Unknown to me. Genus? The ♂ has a band formed of three short streaks.
= *Cobalus virbius*, Cram.
- „ *hersilia*, Plötz (492), Rio Janeiro. = *Rhithon alus*, Mab. Herrich-Schäffer's name has priority.
- Cobalus bistrigula*, H.-S. (497), Loc.? Near *Hesperia obeda*, Butl. Genus?
- Hesperia cyrus*, Plötz (498), Rio Janeiro. = *Pamphila angularis*, Müschl. Genus?
- „ *parvipuncta*, Müschl. (500), Surinam. There is a pair of this species from Cuba in the G. & S. coll.; the ♂, however, wants the two small hyaline spots on the primaries shown by Plötz. Genus?
- Goniloba hemeterius*, H.-S. (501), Loc.? Plötz figures the ♂ of a different species from Brazil under this name. *C. erebina*, Müschl., = *Hesperia cynea*, Hew., as stated in the 'Biologia,' under the genus *Rhithon*.
- Carystus erebina*, Müschl. (502), Colombia. This may be the ♀ of Plötz's *C. erebina*, which cannot be included in the genus *Rhithon*. Herrich-Schäffer's name has to be used in any case.
- Cobalus samedia*, H.-S. (503), Loc.? Belongs near *Æonus*. A ♂ from Bolivia in G. & S. coll. is very like it.
- Hesperia degener*, Plötz (504), Loc.? Belongs near *Æonus*. Two males from Venezuela in the G. & S. coll.
- „ *lydora*, Plötz (505), Venezuela. Very like *Oligoria maculata*, Edw. Unknown to me. ? American.
- Cobalus grossula*, H.-S. (507), Loc.? = *Oligoria maculata*, Edw.
- „ *deleta*, H.-S. (508), Loc.? Perhaps the ♀ of *H. cyrus*, Plötz.
- Hesperia duroca*, Plötz (509), Rio Janeiro. = *Carystus obeda*, Butl., ♂. Genus? Herrich-Schäffer's name has priority.
- Goniloba aphilos*, H.-S. (511), Loc.?

- Cobalus elegantula*, H.-S. (513), Genus? Several specimens of it
Loc. ? from Brazil in the G. & S.
coll.
- Hesperia quadrangula*, Plötz (514), A close ally of *C. elegantula*, H.-S.
Brazil. Genus? Also contained in
the G. & S. coll.
- Cobalus subcordata*, H.-S. (515), Genus? Occurs in Guiana and
Loc. ? Brazil.
- Hesperia olympia*, Plötz (516), = *Cobalus subcordata*, H.-S., var.
Brazil.
- „ *norus*, Plötz (518), New = *Oligoria maculata*, Edw., var.
Orleans.
- Pamphila theogenis*, Capr.* (519), Not identified in the G. & S. coll.
Surinam.
- Cobalus dama*, H.-S. (522), Loc. ? Not identified in the G. & S. coll.
♀ looks like *Prenes vala*,
Mab.
- Hesperia cornelius*, Latr. (525), Plötz's figure represents *Prenes*
Cuba. *ocola*, Edw., and his deter-
mination is, perhaps, correct.
- Cobalus tripunctus*, H.-S. (526), Near *Megistias*. Occurs also in
Cuba. S. America. *Pamphila ancus*,
Möschl., is the same species.
- Hesperia gura*, Plötz (528), Chi- = *Eutychide midia*, Hew., and *Hes-*
riqui. *peria favetta*, Plötz.
- Goniloba complana*, H.-S. (529), = *Eutychide midia*, Hew. Plötz's
Loc. ? drawing is taken from a Nica-
raguan specimen. Herrich-
Schäffer's name has priority.
- „ *corope*, H.-S. (530), = ♂ ♀, *Damas clivus*, Er.
Loc. ?
- Hesperia cteocla*, Plötz (531), Rio Probably a *Cobalus*, allied to *ga-*
Janeiro. *bina*, Godm.
- Curystus orope* (Plötz), Capronn. Unknown to me.
(533), Botafogo, Brazil.
- Cobalus neroides*, H.-S. (534), Loc. ? Not identified in the G. & S. coll.
? American.
- Hesperia dalima*, Plötz (538), Probably belongs to *Vacerra*.
Brazil. There is a ♂ very like it in
the G. & S. coll.
- „ *dispersa*, Plötz (541), = *Lerodea eufala*, Edw. Descrip-
Cuba. tion unpublished ?
- „ *philerope*, Plötz (542), Not identified in the G. & S. coll.
Brazil.
- „ *credula*, Plötz (551), Not identified in the G. & S. coll.
Brazil.
- Goniloba cubana*, H.-S. (556), Cuba. Very like *Hesperia quadrangula*,
Plötz, ♀. Genus?
- Hesperia osca*, Plötz (557), Caracas. Not identified in the G. & S. coll.
- „ *sabaea*, Plötz (560), Brazil. A ♂ from Colombia in the G. & S.
coll. very like this, but with
small hyaline spots.
- „ *ulrica*, Plötz (561), Rio Not identified in the G. & S. coll.
Janeiro.

* Figured by Capronnier in Ann. Soc. Ent. Belg. xvii. t. i. fig. 8.

- Hesperia xanthosticta*, Plötz (562), Pará. Not identified in the G. & S. coll.
- Goniloba complanula*, H.-S. (564), Loc. ? = *Turesis Lucasi*, F. Plötz's drawing is taken from a Chiriqui specimen.
- Hesperia yema*, Plötz (565), West Indies. = *Turesis Lucasi*, F. *Carystus hebon*, Mab., and *Pamphila silacea*, Möschl., are probably varieties of the same species. Description unpublished ?
- „ *verticalis*, Plötz (567), Brazil. Genus ? A female from Rio Janeiro in the G. & S. coll. may belong to this species, but it has only one outer spot on the primaries instead of two.
- „ *commodus*, Plötz (568), Brazil. Numerous specimens (♂ ♀) in the G. & S. coll. Genus ?
- „ *dyma*, Plötz (569), Brazil. Genus ? A pair in the G. & S. coll.
- „ *dedecora*, Plötz (571), La Guayra. Not identified in the G. & S. coll.
- Goniloba exoteria*, H.-S. (572), Loc. ? = *Amblyscirtes nanno*, Edw. Herrich-Schäffer's name has priority.
- Hesperia Grotei*, Plötz (573), United States. = *Atrytonopsis hianna*, Scudd., ♂, var.
- „ *lochius*, Plötz (576), La Guayra. = *Lerema bipunctata*, Mab. Plötz's name has priority.
- „ *dido*, Plötz (577), Venezuela. Probably *Lerema accius*, S. & A., var., ♀.
- „ *phocylides*, Plötz (578), La Guayra. Probably a small ♀ of *Lerema accius*, S. & A.
- „ *edata*, Plötz (580), La Guayra. ? = *Megistias isus*, Godm., ♀. Plötz's name has priority.
- „ *tyrtæus*, Plötz (581), La Guayra. = *Megistias telata*, H.-S., var.
- „ *judas*, Plötz (584), Novo Friburgo, Brazil. Unknown to me. ? near genus *Atrytonopsis*.
- „ *wimico*, Plötz (585), Florida. = *Prenes panoquin*, Scudd. Description unpublished ?
- „ *pudorina*, Plötz (587), Brazil. Belongs near *Catia*. Numerous specimens (♂ ♀) in the G. & S. coll.
- „ *lupulina*, Plötz (588), Loc. ? = *Atrytone inimica*, Butl. & Druce.
- „ *hnata*, Plötz (589), Loc. ? = *Cymænes berus*, Mab. Plötz's name has priority.
- „ *silene*, Plötz (590), Loc. ? = *Cymænes berus*, Mab., var.
- „ *corticea*, Plötz (591), La Guayra. = *Megistias epiberus*, Mab. *Hesperia noctis* and *lysias*, Plötz, are doubtless varieties of the same species. Plötz's name *corticea* has priority over *epiberus*, Mab.
- „ *vetulina*, Plötz (597), Loc. ? = *Euphyes verna*, Edw., ♂.

- Hesperia lidia*, Plötz (607), Loc. ? Probably a var. of *Limochores manatuaqua*, Seudd.
- „ *eulogius*, Plötz (608), Mexico. = *Atrytone mellona*, Godm. Plötz's name has priority.
- „ *vesuria*, Plötz (612), Jamaica. Δ *Catia*, near *Druryi*, Latr. Also in G. & S. coll.
- „ *gemma*, Plötz (613), Loc. ? = *Pamphila ravola*, S. & G., ♂, from Dominica, as already noted by Weymer and Mabilie. Belongs near the genus *Catia*. Plötz's name has priority.
- „ *myrona*, Plötz (614), Venezuela. = *Pamphila kenava*, Butl., ♂. Belongs near *Molo*.
- „ *floridensis*, Plötz (616), Florida. = *Limochores palatka*, Edw., ♂.
- „ *amanda*, Plötz (617), Loc. ? Probably a var. of the N.-American *Erymnis ottoe*, Edw., ♂.
- „ *lysias*, Plötz (623), Chiriqui. = *Megistias epiberus*, Mab., and *Hesperia corticea*, Plötz. Plötz's names antedate that of Mabilie.
- „ *mutius*, Plötz (625), Georgia. = *Atrytone arogos*, Boisd., var., ♂.
- „ *Huebneri*, Plötz (626), West Indies. = *Atrytone vitellius*, F. Description unpublished ?
- Pamphila magdalia*, H.-S. (631), Cuba. This Cuban insect has stood for many years under the name *Thymelicus nanus*, H.-S., in the G. & S. coll. This latter species, according to Plötz's figure of it, is an *Ancyloxypha*. There is a specimen of *T. nanus* in Mr. Druce's collection.
- Hesperia magica*, Plötz (632), Cuba. = *Choranthus radians*, Luc., var., ♂ ♀.
- „ *ammonia*, Plötz (633), Loc. ? Perhaps a dark form of the ♀ of *Choranthus radians*, Luc.
- „ *radians*, Luc. (634), Cuba. This figure, if really belonging to *H. radians*, ♀, represents a dark, almost immaculate form.
- „ *clara*, Plötz (635), California. Apparently a pale var. of *Thymelicus brettus*, Boisd., ♂.
- „ *combinata*, Plötz (636), Colombia. = *Thymelicus vibex*, Hübn., ♂. Description unpublished ?
- „ *uma*, Plötz (637), Philadelphia. = *Thymelicus brettus*, Boisd., ♂.
- „ *emma*, Plötz (639), Chile. = *Hylephila fasciolata*, Blanch., ♂ ♀. Description unpublished ?
- „ *ancora*, Plötz (641), Loc. ? = *Hylephila phylæus*, Drury, ♂ ♀.
- „ *ignorans*, Plötz (647), Loc. ? Probably belongs to *Poltes*. There is a ♀ very like it, from Merida, Venezuela, in the G. & S. coll.
- „ *dares*, Plötz (648), Loc. ? Belongs to *Thymelicus*. There are several specimens (♂ ♀) of this species, from Brazil and Bolivia, in the G. & S. coll.

- Hesperia lina*, Plötz (649), Bogotá. Probably belongs to *Polites*. There is a ♀ of it from Colombia in the G. & S. coll.
- „ *reticulata* (650), La Guayra and Chiriqui. = *Iamphila suffenas* and *meton*, Mab. Plötz's name has priority. The species is referred to *Phlebodes* by Mabille. The four specimens figured by Plötz seem to represent more than one species.
- „ *zachæus*, Plötz (652), Surinam. = *Atrytone melane*, Edw., var., ♂, with the secondaries immaculate above.
- Cobalus vitellina*, H.-S. (653), Loc. ? = *Atrytone melane*, Edw. Plötz's figures (♂ ♀) were made from Mexican specimens. The two names were published in the same year, 1869.
- Hesperia erratica*, Plötz (656), Guatemala. = *Atrytone zabulon*, Boisd., ♂. Plötz's figures (655) of *A. zabulon*, from Buffalo, represent *A. hobomok*, Harr.
- „ *subreticulata*, Plötz (658), Loc. ? = *Cherephon rhesus*, Edw., ♀. Plötz's drawing was made from a Mexican specimen.
- „ *francisca*, Plötz (666), California and Mexico. = *Ochlodes agricola*, Boisd., ♂ ♀. The Mexican habitat requires confirmation.
- „ *amphissa*, Plötz (667), Venezuela. = *Atalopedes campestris*, Boisd., ♂ ♀.
- „ *grynea*, Plötz (670), Chile. = *Hylephila fulva*, Blanch., ♀.
- „ *augustus*, Plötz (676), Brazil. Probably belongs to *Atrytone*. There is a similar unnamed form from Brazil in the G. & S. coll.
- „ *angulina*, Plötz (677), Brazil. = *Hesperia oropa*, Hew., ♂. Belongs near *Metron*.
- Pamphila fasciata*, Müschl. (678), Surinam. = *Hesperia oropa*, Hew., ♀. Wrongly identified in the 'Biologia' as the ♀ of *Metron chrysogaster*, Butl. Müschler's name has priority.
- Hesperia ulphila*, Plötz (679), Mexico. An *Atrytone*, near *monticola*, Godm., with larger spots on the primaries and the underside of the secondaries differently marked. The figures seem to represent two species.
- Pamphila lamida*, Müschl. (680), Colombia. Probably the ♀ of a species of *Atrytone*. Unknown to me.
- Hesperia statius*, Plötz (686), Venezuela. = *Serdis venezuelæ*, Westw., and *S. fulgens*, Mab., ♂ ♀.
- Pamphila antiqua*, H.-S. (687), Cuba. = *Phemiades utha*, Hew. Herrich-Schäffler's name has priority.
- Hesperia serina*, Plötz (697), Mexico. An Eastern species of *Padraona*, not Mexican.

- Hesperia tropica*, Plötz (698), Mexico. An Eastern species of *Padraona*. Java? is pencilled on the drawing.
- " *exilis*, Plötz (706), California. Probably the ♀ of a species of *Vinius*, near *arignote*, Godm. Locality doubtless incorrect.
- " *letis*, Plötz (710), Rio Janeiro. = *Vinius nicomedes*, Mab., ♂. Both names were published in 1883.
- Apantus argynnus*, Plötz (733), Brazil. Unknown to me. Genus?
- " *odilia*, Plötz (734), Brazil. Near *Phlebodes unia*, Butl., from Haiti. Genus?
- " *acroleuca*, Plötz (743), Brazil. Near genus *Artines*. Not in G. & S. coll.
- " *interpunctata*, Plötz (753), Bahia and Pará. = *Callimormus vetula*, Mab.
- Papilio saturnus*, F. (755), S. Am. This figure, taken from a Pará specimen, seems to represent *Forates decora*, H.-S.
- Apantus levina*, Plötz (760), Rio Janeiro. Genus? Unknown to me.
- " *flavocostata*, Plötz (761), Rio Janeiro. Genus? An allied form from Guiana in the G. & S. coll.
- " *ferrago*, Plötz (762), Loc.? = *Padraona epictetus*, F., var.
- " *eudesmia*, Plötz (763), Mexico. = *Padraona epictetus*, F., var.
- " *vicinus*, Plötz (764), Loc.? Genus? An allied form from Colombia in the G. & S. coll.
- " *imerius*, Plötz (765), Brazil. Genus? From the "Kaden" collection in the G. & S. coll.
- " *Prittwitzii*, Plötz (771), Mexico. = *Adopæoides simplex*, Godm. (nec Feld.). Felder's species, to judge from Plötz's figure (775), appears to be a species of *Zariaspes* unknown to me.
- " *euphrasia*, Plötz (773), Mexico. = *Ancyloxypha arene*, Edw., ♀, dark var. *A. leporina*, Plötz, doubtless belongs to the same species.
- Goniloba singularis*, H.-S. (776), Cuba. = *Copæodes aurantiaca*, Hew., ♂. Plötz's figure is taken from a Mexican specimen. Herrich-Schäffer's name has priority.
- Thymelicus isidorus*, Plötz (780), Mexico. = *Oarisma powesheik*, Park., var.
- " *nanus*, H.-S. (781), Cuba. An *Ancyloxypha*, near *arene*, Edw.
- Butleria mesoxantha*, Plötz (815), Venezuela. = *B. cypselus*, Feld., var., a species included by Mabille in his genus *Dalla*.
- " *xantholeuca*, Plötz (816), Venezuela. = *B. dimidiata*, Feld., var., referred by Mabille to his genus *Dalla*.
- " *ligilla*, Plötz (820), Loc.? Very near *B. caicus*, Hew.
- " *apertus*, Plötz (824), Loc.? Near the Chilian *B. bisserguttata*, Philippi.

- Butleria pruna*, Plötz (828), San Domingo. There is an allied form from Rio Janeiro, with a similarly coloured underside, in the G. & S. coll.
- Carterocephalus flavimargo*, Plötz (829), Chile. = *Argopteron aureipenne*, Blanch., ♀.
- Cyclopides gyrans*, Plötz (843), Mexico. = *Dalla* (*Butleria*) *anomala*, Mab. Plötz's name has priority.
- „ *ritus*, Plötz (848), Chile. Probably belongs to *Butleria*, near *tripunctata*, Mab.
- Leucochitonea ligania*, Plötz (862), S. Am. = *Heliopetes alana*, Reak., var.
- „ *culatia*, Plötz (865), Venezuela. = *Heliopetes nivella*, Mab. Plötz figures (864) a very similar form, almost entirely white above, from Cayenne, as *H. maimon*, F. Description unpublished?
- Pyrgus aconyta* (H.-S.), Plötz (871), Georgia. Very like *Heliopetes domicella*, Er., but greener. Description unpublished?
- Syrichthus valdivianus*, Philippi (875), Chile. A *Hesperia*, very near *H. trisiynuta*, Mab., and *H. notata*, Blanch.
- Pyrgus adjutrix*, Plötz (882), Buenos Aires. ? = *Hesperia montivaga*, Reak. Plötz's figures were taken from Mexican specimens.
- „ *insolatrix*, Plötz (887), Mexico. ? = *Hesperia notata*, Blanch.
- „ *albescens*, Plötz (889), Mexico. ? = *Hesperia montivaga*, Reak.
- „ *varus*, Plötz (900), Mexico. ? = *Hesperia montivaga*, Reak.
- „ *lycurgus*, Plötz (901), Centr. America. ? = *Hesperia notata*, Blanch.
- Carcharodus radiatus*, Plötz (907), Texas. = *Celotes nesus*, Edw.
- Ephyriades variegata*, Plötz (911), Rio Janeiro. Belongs to *Dicæus*, near *lucæna*, Hew.
- Pythonides dilucida*, Möschl. (916), Surinam. Unknown to me.
- „ *cæruleus*, Plötz (930), Brazil. = *Paches limæa*, Hew. (*iabesa*, Butl.).
- Hesperia tertullianus*, F. (935), Loc. ? Plötz figures a ♀ specimen, from Minas Geraes, of *Leucochitonea lancea*, Hew., as this species. Genus?
- Pythonides alaricus*, Plötz (938), Bahia. A *Paramimus*, near *scurra*, Hüb. Not represented in the G. & S. coll.
- Syrichthus leucodesma*, Er. (939), Guiana. = *Paramimus scurra*, Hüb., var., without the red spot.
- Pythonides servatius*, Plötz (944), Pará. An *Atarnes*, near *Sallei*, Feld.
- „ *prudens*, Plötz (954), Surinam. Probably belongs to *Achlyodes*. From Cayenne and Chapada in G. & S. coll.

- Achlyodes nivonicus*, Plötz (956), Mexico. Apparently = *Pellicia dimidiata*, H.-S., ♀. Figured from a damaged specimen.
- " *thiena*, Plötz (957), Loc. ? An *Achlyodes*, near *Fredericus*, Hübn. From British Guiana and Pará in the G. & S. coll.
- " *serapion*, Plötz (959), Novo Friburgo. Not identified in the G. & S. coll.
- " *plumbago*, Plötz (960), Loc. ? = *Achlyodes chalybs*, Mab. Plötz's name has priority. From Pará and Ega in the G. & S. coll.
- " *protius*, Plötz (961), Brazil. = *Achlyodes pulverea*, Mab. From Rio Janeiro in the G. & S. coll.
- " *gorgona*, Plötz (963), Guatemala. = *Chiomara gesta*, H.-S., var.
- " *basigutta*, Plötz (964), S. Am. = *Chiomara punctum*, Mab.
- " *noctula*, Plötz (965), Pará. = *Chiomara mthrax*, Möschl.
- Hesperia bigutta*, Prittw. (977), Loc. ? = *Chiomara gesta*, H.-S., var.
- Achlyodes blanda*, Plötz (980), Loc. ? = *Chiomara gesta*, H.-S., var.
- " *servius*, Plötz (981), Brazil. = *Pythonides hyacinthinus*, Mab.
- " *erisichthon*, Plötz (982), Loc. ? A *Pythonides*, near *phila*, G. & S.
- " *cnidus*, Plötz (983), Loc. ? A *Pythonides*, unknown to me.
- " *balma* (H.-S.), Plötz (984), Brazil. = *Pythonides zera*, Butl. Description unpublished ?
- Antigonus sericus*, Plötz (990), Chiriqui. = *Systasea corrosa*, Mab.
- " *liborius* (H.-S.), Plötz (991), Bahia. A *Systasea*, near *corrosa*, Mab. From Chapada in G. & S. coll. Description unpublished ?
- " *bipuncta*, Plötz (995), Mexico. = *Theagenes lactifera*, Butl., ♀, var. Plötz's figures (994) of *T. noctua*, Feld., ♂ ♀, agree with *T. lactifera*, Butl.
- " *aura*, Plötz (998), Brazil. = *Diphoridas dichrous*, Mab. This species may be the *Hesperia palpalis* of Latreille.
- " *badia*, Plötz (999), Chanchamayo. = *Ehrietas infanda*, Butl.
- " *robigus*, Plötz (1006), S. Am. = *Echelatus luctuosus*, G. & S. Plötz's name has priority.
- Achlyodes auxo*, Möschl. (1008), Colombia. = *Camptopleura theramenes*, Mab.
- Antigonus patens*, Plötz (1009), Rio Janeiro. Unknown to me. Perhaps a species of *Gorgophone*.
- " *tortricinus*, Plötz (1010), Panama and Venezuela. ♂ = *Ebrietas anacreon*, Staud.; ♀ = *E. infanda*, Butl., or *E. isus*, Mab.

- Antigonus elaudia* (H.-S.), Plötz (1012), La Guayra. An *Ebrietas*, near *eclyptica*, Butl. Description unpublished?
- " *triseriata* (H.-S.), Plötz (1013), Venezuela. An *Ebrietas*, probably a var. of *E. elaudia*.
- " *eremita*, Plötz (1014), S. Am. ? Belongs to *Ebrietas*. Unknown to me.
- " *simplicior*, Plötz (1015), Brazil. Belongs to *Echelatus*. Type is a ♂.
- " *alburnea*, Plötz (1016), Pará. An *Echelatus*, and probably the ♀ of *E. simplicior*. There is a specimen of it from Paraguay in the G. & S. coll.
- " *cajus*, Plötz (1023), Peru. Belongs to *Eudamidas*. There are three specimens of it from Peru in the G. & S. coll.
- " *adamas*, Plötz (1031), Brazil. ♂ = *Sostrata leucorrhoea*, G. & S.; ♀ = *S. scintillans*, Mab.
- Thanaos zarucco*, Luc. (1035), Cuba. = *Thanaos martialis*, Scudd. Lucas's name has priority.
- Antigonus diogenes*, Plötz (1041), Cuba. Belongs to *Thanaos*. Also from Cuba in the G. & S. coll.
- " *heteropterus*, Plötz (1044), Brazil. Belongs to *Thanaos*. There is a long series of this species from Chapada in the G. & S. coll.
- " *jamaicensis*, Plötz (1045), Jamaica. Belongs to the genus *Melanthes*, Mab. Very near the variable *M. zephodes*, Hübn. (figs. 1037, 1038 of Plötz), from Cuba and the Bahamas. The ♂ only of the Jamaican insect is figured by Plötz.
- Nisoniades flavipalpis*, Plötz (1051), Copiapó. Not identified in the G. & S. coll. Genus *Staphylus*? Figure taken from a ♂.
- " *eusebius*, Plötz (1053), Centr. America. = *Staphylus giselus*, Mab.
- Achlyodes trochilus*, Hopff. (1055), Peru. Belongs to *Gorgopas*. This insect is identified as *Hesperia chlorocephala*, Latr., in the G. & S. coll.
- Hesperia chlorocephala*, Latr. (1056), Brazil. Plötz's figure of this species represents a *Staphylus*.
- Nisoniades auricapilla* (Hopff.), Plötz (1057), Pará. Genus? Not *Staphylus aurocapilla*, Staud. Description unpublished?
- " *norica*, Plötz (1059), Brazil and Cayenne. Genus? Not identified in the G. & S. coll.
- " *æta*, Plötz (1060), Chiriqui and Brazil. A *Staphylus*, ♂. ? = *mazans*, Reak. The figure is taken from a Brazilian specimen.
- " *aterea*, Plötz (1062), Rio Janeiro. = *Systasea incisa*, Mab., var.
- Tagiades tenuatus*, Plötz (1068), Oaxaca. = *Systasea pulverulenta*, Feld., var.
- " *doria*, Plötz (1075), Mexico. A *Timochreon*, and probably a var. of *satyrus*, Feld.

- Tagiades monophthalma*, Plötz (1077), Brazil. Belongs to *Cyclosæmia*. From Parana in the G. & S. coll.
- " *diophthalma*, Plötz (1078), Loc. ? A *Cyclosæmia*, near *earina*, Hew.
- " *jacobus*, Plötz (1082), Rio Janeiro. Belongs to *Cyclosæmia*.
- " *moreus*, Plötz (1083), Brazil. Belongs to *Cyclosæmia*. A specimen very like it from Entre Rios in the G. & S. coll.
- " *kiera*, Plötz (1103), Loc. ? = *Celænorrhinus eligius*, Cram.
- Phareas ferrugineus* (1121), Bahia. Probably a *Lignyostola*, near *despecta*, Butl. Unknown to me.
- " *cervinus*, Plötz (1122), Loc. ? = *Eudamus pausius*, Hew., var. Genus ?
- " *epimethea* (*epiminthea*), Plötz (1123), Brazil. Belongs to *Lignyostola*.
- " *Annæ*, Plötz (1135), Pará. = *Entheus lemna*, Butl., ♀.
- Entheus concinna*, Plötz (1142), Pará. Unknown to me.
- Erycides imbreus*, Plötz (1198), Centr. America. A *Phocides*, near *alemon*, Cram. Unknown to me.
- Eudamus batabano*, Luc. (*mancinus*, H.-S.) (1200), Cuba. Belongs to *Phocides*.
- Erycides erebus*, Plötz (1201), Bahía. Probably a *Tarsoctenus*. Unknown to me.
- " *Herrichi*, H.-S. (1204), Loc. ? A *Tarsoctenus*, near *plutia*, Hew.
- " *lincea*, H.-S. (1209), Loc. ? Very like *Nascus phocus*, Cram., ♂. The drawing is marked = *E. grandimacula*, Mab., a Brazilian insect. Herrich-Schäffer's name has priority.
- Pyrrophypge Martii*, Plötz (1237), Brazil. Probably belongs to *Sarbia*.
- Myscelus epigona*, H.-S. (1248), Loc. ? This species was wrongly identified in the 'Biologia' as synonymous with *Rhabdoides epigona*, Butl., and the reference to it in that work must be erased. *M. orbis*, Mab., is very nearly related to *M. epigona*, H.-S. Plötz's figures are taken from Venezuelan specimens.
- Pyrrophypge denticulata*, H.-S. (1289), Loc. ? A *Mysoria*, near *pelota*, Plötz. Plötz's drawing was made from a Rio Negro specimen.
- Goniurus Platorii*, Plötz (1317), Loc. ? Probably a var. of *Eudamus esmeraldus*, Butl., with the dark bands on the underside of the secondaries coalescent.
- " *brevicauda*, Plötz (1319), Chiriquí. = *Thymele eniopeus*, G. & S. Plötz's name has priority.
- " *dominicus*, Plötz (1321), Loc. ? = *Eudamus albimargo*, Mab.
- " *gideon*, Plötz (1324), Loc. ? = *Goniurus calus*, Cram.

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| <i>Eudamus tellus</i> , Plötz (1327), Buenos Aires. | A <i>Nascus</i> , near <i>cephise</i> , H.-S. |
| " <i>ignatus</i> , Plötz (1328), Loc. ? | Drawing missing. |
| " <i>albociliata</i> , Plötz (1329), Colombia. | " " |
| <i>Telemiades dianina</i> , Plötz (1331), S. Am. | " " |
| <i>Netrocoryne coronus</i> , Plötz (1332), Chiriqui. | " " |
| <i>Telegonus corentinus</i> , Plötz (1333), Surinam. | " " |
| " <i>ophiuchus</i> , Plötz (1334), Surinam. | = <i>Bungalotis sebrus</i> , Feld., ♂. |
| " <i>mutius</i> , Plötz (1335), Colombia. | = <i>Bungalotis salatis</i> , Cram., ♀, var. |
| " <i>pertica</i> , Plötz (1336), S. Am. | Near <i>Lychnuchus clearchus</i> , Plötz, but with three subapical spots and an oblique band on the primaries white. |
| <i>Arteurotia meris</i> , Plötz (1339), Colombia. | Probably a <i>Pellicia</i> . |
| " <i>epipola</i> , Plötz (1340), Cayenne. | = <i>Spioniades clinias</i> , Mab. Genus ? |
| <i>Æthilla Weymeri</i> , Plötz (1342), Loc. ? | = <i>Telegonus chiriquensis</i> , Staud., and <i>T. meretrix</i> , Hew. Plötz's drawing is taken from a Chiriqui specimen. |
| <i>Hesperia caura</i> , Plötz (1353), Surinam. | May belong to <i>Papias</i> . |
| " <i>Edlichi</i> , Plötz (1354), Loc. ? | Genus ? Type is ♀. |
| " <i>zalma</i> , Plötz (1355), Panama. | Possibly = <i>Mnasilus penicillatus</i> , Godm. |
| " <i>beda</i> , Plötz (1357), Blumenau. | Genus ? Not unlike <i>Perimeles remus</i> , F. |
| " <i>camposa</i> , Plötz (1360), Brazil. | Belongs to <i>Pyrrhopygopsis</i> . Not represented in the G. & S. coll. |
| " <i>quispica</i> , Plötz (1361), Peru. | A <i>Pyrrhopygopsis</i> , near <i>socrates</i> , Mén., but with yellow cilia and a black head. |
| " <i>angulis</i> , Plötz (1367), Panama. | = <i>Damas clavus</i> , Er., ♂. <i>Proteides cervus</i> , Möschl., is the ♀ of the same species. |
| " <i>huscinia</i> , Plötz (1369), Blumenau. | Belongs to <i>Perichares</i> , near <i>agrippa</i> , Godm., ♂. |
| " <i>gila</i> , Plötz (1370), Arizona. | = <i>Cogia hippalus</i> , Edw., ♂. |
| " <i>licia</i> , Plötz (1372), Loc. ? | = <i>Xenoides orchamus</i> , Cram., ♂, var. |
| " <i>cinerita</i> , Plötz (1378), Brazil. | Not identified in the G. & S. coll. |
| " <i>diana</i> , Plötz (1383), San Paulo. | " " " |
| " <i>hilda</i> , Plötz (1384), Blumenau. | " " " |

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| <i>Hesperia wruba</i> , Plötz (1385), | Not identified in the G. & S. coll. |
| Brazil. | |
| " <i>zygia</i> , Plötz (1388), Loc. ? | ? American. Unknown to me. |
| " <i>yva</i> , Plötz (1389), Loc. ? | Very like <i>Cobalus argus</i> , Möschl. The specimen figured is from Blumenau, Brazil. |
| " <i>angellus</i> , Plötz (1393), | Perhaps the ♀ of <i>Halotus saxula</i> |
| Chiriqui. | (Mab.), Godm., with whiter spots. Plötz's name has priority. |
| " <i>velleius</i> , Plötz (1394), Su- | = <i>Rhithon bistrigula</i> , H.-S. (<i>alus</i> , |
| rinam. | Godm.). |
| " <i>corisana</i> , Plötz (1395), | Unknown to me. |
| Surinam. | |
| " <i>zeppa</i> , Plötz (1397), Suri- | " " |
| nam. | |
| " <i>cethra</i> , Plötz (1399), Suri- | " " |
| nam. | |
| " <i>nulla</i> , Plötz (1401), Suri- | " " |
| nam. | |
| " <i>favetta</i> , Plötz (1408), Chi- | = <i>Eutychide complana</i> , H.-S. (<i>mi-</i> |
| riquí. | <i>dia</i> , Hew., <i>gura</i> , Plötz). Plötz's figure of upperside too green, as in many other cases. |
| " <i>conta</i> , Plötz (1410), Minas | Perhaps = <i>Pamphila ancus</i> , Möschl. |
| Geraes. | |
| " <i>autumna</i> , Plötz (1411), | = <i>Cobalopsis edda</i> , Mab., ♂. <i>H.</i> |
| Centr. America. | <i>pelora</i> , Plötz, is apparently a large ♀ of the same species, and this is a still older name, both antedating that of Mabile. |
| " <i>cabella</i> , Plötz (1419), | = <i>Rhithon chiriquensis</i> , Mab., ♂. |
| Puerto Cabello. | |
| " <i>subviridis</i> , Plötz (1426), | Not identified in the G. & S. coll. |
| San Paulo. | |
| " <i>noctis</i> , Plötz (1431), Chi- | = <i>Megistias epiberus</i> , Mab., dark |
| riquí. | var. See note under <i>Hesperia lysias</i> , Plötz (fig. 623). |
| " <i>gereon</i> , Plötz (1432), | Not identified in the G. & S. coll. |
| Pará. | |
| " <i>aurinia</i> , Plötz (1436), Ja- | Probably belongs to <i>Limochores</i> or |
| maica. | <i>Serdis</i> . Not contained in the G. & S. coll. |
| " <i>Zenckii</i> , Plötz (1437), | = <i>Thymelicus vibex</i> , Hübn., ♂, vars. |
| Mexico. | <i>H. combinata</i> , Plötz (636), is the same species. |
| " <i>monica</i> , Plötz (1439), | An <i>Atrytone</i> , near <i>eulogius</i> , Plötz. |
| Blumenau. | There is a ♂ of it, from Novo Friburgo, in the G. & S. coll. |
| " <i>piro</i> , Plötz (1440), Pa- | = <i>Atrytone rolla</i> , Mab., ♂. |
| nama. | |
| " <i>zela</i> , Plötz (1441), Monte | Probably belongs near <i>Atrytone</i> . |
| Video. | Not identified in the G. & S. coll. |
| " <i>hyana</i> , Plötz (1443), | = <i>Hylephila fulva</i> , Blanch., ♂. |
| Chile. | |

- Hesperia morganta*, Plötz (1444), S. Am. = *Thymelicus brettus*, Boisd., ♂, var. The specimen figured by Plötz is from North America.
- „ *catilina*, Plötz (1445), Blumenau. Genus? *H. sulfurina*, Mab., is probably the same species; and if this is the case, Mabilie's name has priority.
- „ *genoa*, Plötz (1446), Nevada. ? = *Polites subuleti*, Boisd., var.
- „ *axius*, Plötz (1448), Colorado. Belongs to *Chærephon*, and probably = *rhesus*, Edw., ♂ ♀.
- „ *librita*, Plötz (1453), Panama. = *Augiades hecale*, Godm. Plötz's name has priority.
- „ *hyboma*, Plötz (1455), Minas Geraes. Perhaps belongs to *Padraona*. Underside of secondaries marked very much as in *Phe-miades proprius*, F.
- Pamphila humeralis*, Mab. (1456), Pará. Near *Molo*. Not in G. & S. coll.
- Apaustus vopiscella*, Plötz (1471), Minas Geraes. Not identified in the G. & S. coll.
- „ *facilis*, Plötz (1474), Surinam. Probably *Mnasitheus simplicissima*, H.-S., ♀.
- „ *scheria*, Plötz (1475), Pará. Genus? A specimen (♂) from the Amazons in the G. & S. coll.
- „ *alsimo*, Plötz (1479), Surinam. Probably = *Callimormus gracilis*, Feld.
- „ *polita*, Plötz (1481), Loc.? A *Callimormus*, near *juventus*, Scudd.
- „ *fabulinus*, Plötz (1482), Surinam. Probably a *Callimormus*, near *vetula*, Mab.
- „ *bebarus*, Plötz (1483), Colombia. Genus? A ♀ from the Lower Amazons in the G. & S. coll. very near it.
- „ *servilius*, Möschl. (1487), Surinam. Genus? Not identified in the G. & S. coll.
- „ *sulla*, Möschl. (1488), Colombia. Not identified in the G. & S. coll.
- Heteropterus Jelskyi*, Ersch. (1490), Peru. Unknown to me.
- Apaustus krevos*, Plötz (1491), Pará. Not unlike *A. imerius*, Plötz (765).
- „ *matuta*, Plötz (1498), Loc.? Perhaps an ally of *Hesperia reticulata*, Plötz. Genus?
- Thymelicus macra*, Plötz (1500), N. Am. = *Copeodessingularis*, H.-S. (*aurantiaca*, Hew., *procris*, Edw.), var.
- „ *tucumanus*, Plötz (1503), Cordova. Belongs to *Ancyloxypha*, and probably = *arene*, Edw., ♀.
- Cyclopides facetus*, Plötz (1530), Loc.? A *Butleria*, near *flavomaculata*, Blanch. Specimen figured is from Chile, and there is one from Mendoza in the G. & S. coll.
- Pythonides bianca*, Plötz (1535), Loc.? = *Heliopetes petrus*, Hübn., and not *H. arsalte*, L., as queried in the 'Biologia.'

- Leucochitonea pampina*, Plötz (1536), Buenos Aires. Belongs to *Heliopetes*. From Corumba, Chapada, and Paraguay in the G. & S. coll. = *Heliopetes domicella*, Er.
- Pyrgus Willi*, Plötz (1537), Minas Geraes. Belongs to *Hesperia*. Plötz's figure is taken from a Porto Rico specimen.
- „ *crisia*, H.-S. (1550), Cuba. = *Chiomara asychis*, Cram., var.
- Pythionides dilucida*, Müschl. (1552), Surinam. = *Chiomara asychis*, Cram., var.
- Achlyodes onorbo*, Müschl. (1553), Surinam. A *Chiomara*, near *asychis*, Cram.
- Pythionides (Papilio) cerialis*, Cram. (1555), S. Am. Plötz figures a specimen of *P. assecla*, Mab., from Brazil, as this species. There is a specimen of the latter from Chontales in the G. & S. coll., hitherto overlooked.
- Pythionides portulana*, Plötz (1557), S. Am. = *P. festivus*, Er.
- Achlyodes fatinitza*, Plötz (1558), Colombia. Not identified in the G. & S. coll.
- „ *ancholis*, Plötz (1559), Colombia. = *Hesperia tetra*, Mab. Referred by Mabilite to his genus *Bolla*.
- Antigonus oclycles*, Plötz (1560), Colombia. = *Ethilla echina*, Hew., var.
- „ *tolimus*, Plötz (1561), Colombia. Probably belongs to *Gorgophone*, near *varius*, Mab., ♂.
- „ *obliqua*, Plötz (1562), Loc. ? Belongs to *Anastrus*. There is a specimen of it from Santarem in the G. & S. coll.
- „ *zorilla*, Plötz (1567), Panama. Closely related to *Bolla giselus*, Mab., but smaller and with the two small hyaline spots on the primaries well separated. Specimen figured is a ♂.
- Nisoniades tucumanus*, Plötz (1568), Cordova. Belongs to *Staphylus* or *Bolla*. ♂ has a costal fold.
- „ *astur*, Plötz (1569), Surinam. A species with peculiarly formed antennæ (if correctly drawn) and a costal fold. Unknown to me.
- „ *bibiana*, Plötz (1571), Colombia. Belongs to *Anisochoria*, near *sublimbata*, Mab.
- „ *cæcus*, Plötz (1572), Loc. ? A *Cyclosæmia*, near *herennius*, Stoll.
- Tagiades chacona*, Plötz (1573), Panama. An *Ebrietas*, near *ecliptica*, Butl., with bluish grey on the outer part of the secondaries beneath. Figure not good.
- „ *monartus*, Plötz (1579), Panama. = *Celanorrhinus chiriquensis*, Mab. Plötz's name has priority.
- „ *vincula*, Plötz (1580), Panama. Probably a large ♀ of *Staphylus mazans*, Reak. There is a very similar unnamed specimen from Caché, Costa Rica, in the G. & S. coll.

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|---|--|
| <i>Pharcas serenus</i> , Plötz (1587), | = <i>Entheus eumelus</i> , Cram., ♀. |
| Loc. ? | |
| <i>Pyrrhopyge porus</i> , Plötz (1595) | = <i>Mimoniades pityusa</i> , Hew. |
| Colombia. | |
| " <i>parima</i> , Plötz (1597), | Belongs to <i>Yanguna</i> . Not represented in the G. & S. coll. |
| Surinam. | |
| " <i>leucoloma</i> , Ersch. (1599), Peru. | Very near <i>P. sergius</i> , Hopff., but with the white patch on the underside of the secondaries extending further inward. |

XXV.—*Function and Form with Reference to the Hand and Foot in Man and Apes.* By DUNCAN C. L. FITZWILLIAMS, M.D., Ch.M., F.R.C.SS. Ed. & Eng., Demonstrator of Anatomy, King's College, London; Casualty Officer, Hospital for Sick Children, Great Ormond Street.

[Plate V.]

THROUGH the kindness of Professor Cunningham I was enabled to carry out a systematic anatomical study of a gibbon (*Hylobates agilis*) in his possession. In this paper I wish to deal only with the description of the hands and feet of the animal, and incidentally to draw attention to the differences existing in the hands and feet of man.

The orang-utangs, chimpanzees, gorillas, and gibbons are the four great tribes which form the anthropoid family. The larger members of the family resemble man in stature and outward form more nearly than the gibbon, but on closer investigation the gibbon presents certain characteristics which have led many eminent anatomists to place this ape next to man in the scale of animal life. With the single exception of man, the gibbon can assume the erect posture more completely than any other animal.

The Hand.

The hand of the gibbon (Pl. V. fig. 1, A) is remarkable for the great length it possesses in comparison with its width. Measured from the crease in front of the wrist to the tip of the longest finger the length amounts to $15\frac{1}{2}$ cm., but the breadth of the widest part, just above the root of the little finger, does not exceed $3\frac{1}{4}$ cm. The length is due to the development both of the metacarpals and phalanges.

The thenar and hypothenar eminences are small; indeed, so feeble is the development of the latter that it can scarcely

be said to exist. The thumb is short in comparison with the rest of the hand; it extends slightly beyond the level of the metacarpo-phalangeal joint of the second digit, but not as far as the web between the second and third. In man the thumb reaches to the level of the proximal interphalangeal articulation of the index, while the interphalangeal joint of the thumb is on a level with the metacarpo-phalangeal joint of the second digit.

The web of the gibbon's thumb is very small, not reaching halfway down the first metacarpal bone. This gives rise to an appearance as if the palm and the thumb sprang separately from the region of the wrist. In marked contrast to this, the webs of the fingers are much more extensive than those of man, and reach nearly halfway down the elongated proximal phalanges, thereby lengthening the palm at the expense of the fingers. This extensive webbing prevents separation of the fingers to any great extent. As in man, the third digit is the longest. The fingers are placed parallel to one another, but show slight ability to oppose the thumb.

The positions of the deep creases of the skin are as follows:—

1. In front of the wrist there is a deep transverse crease due to the flexion of this joint.

2. From just below the midpoint of the wrist-crease another starts, and runs downwards and outwards into the deep cleft which intervenes between the thenar eminence and the rest of the palm. This crease and cleft are caused by the adduction of the thumb. In man the great development of the thumb-muscles has filled out the cleft and increased the web, while the upper limit of the crease curves outwards round the thenar eminence well below the creases of the wrist.

3. Starting from the same point as the preceding, a crease passes downwards and inwards to the inner margin of the palm, just above its centre. The causation of this line is not very evident, as the muscles of the hypothenar eminence are small. Of such a crease little or no trace is to be found in the human hand; but in the foot of the ape a very similar marking is found in front of the outer part of the heel, the part which corresponds to the hypothenar eminence of the hand (see Pl. V. fig. 1, B).

4. In common with the two preceding yet another crease starts and runs longitudinally down the palm to the root of the third digit.

5. Parallel and to the outer side of the last-mentioned crease is a shorter crease which ends at the cleft between the second and third digits. These creases result probably from the contraction of the contrahentes and palmar interosseous

muscles, which causes the digits to converge on the central one. Both these creases are usually found in the hand of man, but are fainter, more irregular, and more obliquely placed. I believe that cheiromancy attributes great brain-power to the individual possessing one of these lines in a well-marked degree, an assumption highly complimentary to the ape.

6. About a third of the way down the palm is a crease passing transversely across.

7. Halfway down the palm a crease passes across in a curved manner with the concavity towards the wrist.

8. A curved crease, parallel to the last mentioned, is situated about two thirds of the way down the palm. These last two creases evidently correspond to the two deeply marked creases which run obliquely across the human palm. All three transverse creases are due to the folding of the palmar tissues during flexion of the fingers. The obliquity of the lines in the human hand results from the great amount of opposability which exists between the human thumb and the inner four digits. The extra line found in the palm of the ape is probably accounted for, partly by the increased length of the palm, and partly by the constantly flexed position of the hand.

9. Deep creases are present at the roots of the fingers on a level with the webs. These creases run transversely in the case of the second and third digits and obliquely in the case of the fourth and fifth. This same arrangement, though to a less marked degree, is present in the hand of man; the creases of the two outer fingers are transverse, while those of the two inner have an oblique tendency.

The long slender fingers of this ape (Pl. V. fig. 2) are remarkably flat on their palmar aspect. They all exhibit, to a greater or less degree, a longitudinal crease which runs down the centre of the palmar surface. This crease is best marked on the middle digit. It will be seen later that the finer skin-lines of the fingers converge on these central creases.

Owing to the proximal interphalangeal joint of the middle digit being marked in front by two widely separated transverse lines, this digit appears to possess four instead of three phalanges. The thenar eminence is marked by a series of oblique lines running downwards and inwards. On adducting the human thumb similar lines may appear.

The terminal phalanges are bulbous and projecting. The free part of the nail stands well away from the back of the phalanx; in man the nail lies quite close to the back of the ungual phalanx. As the nail of the thumb is the shortest,

broadest, and least arched, it most closely resembles the human nail. As one approaches the little finger the nail of each digit becomes successively longer, narrower, more arched, and therefore more claw-like, in a manner analogous to that noted by Wiedersheim in the human hand. This is due to the greater and more varied use to which the nails of the outer digits are put; that of the little finger, being the least used, retains in a greater degree than the others its primitive claw-like character.

The fine lines on the palmar skin are much coarser than those on the human hand, and in many cases pass interruptedly across the deep creases of the palm.

The coarseness of the finer lines is probably a response to the requirements of function: the animal uses its hands as hooks by which to suspend the weight of the body from the branches, and the friction produced by the finer lines gives firmness to the grip. If the skin of the palm were devoid of lines and perfectly smooth a firm grip, with no slipping, would be difficult to obtain. The delicacy of the lines of the human hand is due to the fact that the hand is no longer an organ merely of grasp, but used for many varied and highly specialized movements.

In the gibbon the lines are arranged in a definite manner and one well calculated to obviate the risk of the hand slipping from a branch. In the lower part of the palm the lines show a general tendency to converge towards the central digit. In the fingers the lines are arranged in a chevron-like manner, converging from the margins downwards towards the longitudinal crease which runs along the centre of each digit. This arrangement is best seen on the proximal and middle phalanges of the third and fourth digits, where the weight of the body chiefly rests. The lines of the proximal and middle phalanges of the second and fifth digits, like the lines of the palm, have a tendency to converge towards the central digit. This tendency survives in the human hand only on those parts which are used solely for grip and not for the execution of any of the finer movements. It is well seen on the palm near to, and on the proximal phalanges of, the index and little fingers, whilst elsewhere the lines run in an irregular manner, forming whorls and triangles which differ in individual hands. This wonderful difference in the patterns met with on the thumb is used by the police in the identification of criminals.

Oblique lines are found to be more efficient mechanical agents for the prevention of slipping than transverse. For

this reason the driving-wheels of all heavy traction-engines are provided with sloping or chevron lines.

Professor Goodsir [1] many years ago pointed out that the hand of man was the only perfect hand, and that while the ape's hand was fitted to grasp a cylinder such as the branch of a tree, it was much less able than the human hand to grasp a sphere. Hepburn [2] has compared the hands of the four anthropoids with that of man, and shown how the development in the latter of the muscles of thenar and hypothenar eminences has modified the position of the creases. In the gibbon the fingers are capable of flexion and adduction to the middle line, but have little tendency to oppose the thumb; the transverse and longitudinal creases are therefore met with. In man opposition of the thumb to the fingers is one of the most prominent characteristics of the hand, and the creases in consequence are oblique.

The Foot.

The foot (Pl. V. fig. 1, B), from the point of the heel to the end of the middle toe, measures 14 cm. in length, of which two thirds belong to the sole and one third to the toes. The width of the sole, exclusive of the great toe, is 2.6 cm. The hallux reaches to the level of the proximal interphalangeal joint of the second toe. Unlike the foot of man, the hallux is not bound up parallel to the other digits, but becomes free just beyond the mid-point of the sole. Behind this point it is marked off from the rest of the foot by a deep crease. The hallux is a much more powerful digit than the pollex. All the toes have a tendency to point outwards, being set at an angle to the plane of the long axis of the sole. In consequence of this angle the four outer digits, on flexion, oppose the great toe. The web of the four outer toes reaches about halfway down the proximal phalanges and prevents any great separation of these digits.

The following are the chief skin-creases found in the sole:—

1. On looking at the sole it is seen to be divided into two unequal parts by a longitudinal crease which starts on the inner side of the heel and, passing forwards, gradually deepens into a cleft which divides the great toe from the rest of the sole. The smaller of these portions carries the hallux, while the larger bears the four outer toes. This dividing crease and cleft are caused by the opposability of the hallux.

2. From the preceding crease near its commencement, another smaller crease passes outwards and forwards in front

of the heel, and corresponds to a similar crease in the hand of the ape. In the human foot neither of these creases is seen.

3. A well-marked crease runs transversely across the sole, even on to the hallux just behind the point where that digit becomes free from the rest of the foot.

4. A still deeper crease runs transversely across the sole just behind the metacarpo-phalangeal articulations. This marks the place at which the long axes of the sole and digits meet at an obtuse angle.

5. At the root of the four other toes there is a deep double crease which slopes from the margins of the foot forward to the middle digit. Creases 3, 4, and 5 are caused by the folding of the tissues on flexion of the toes into the sole. Hepburn [2] figures a crease in the foot of the gibbon running longitudinally, and ascribes its presence to the contractions of the adductor (contrahentes) layer of muscles. In my specimen this crease was absent, and it is interesting to note that the adductor muscles of the four outer toes were also wanting.

The creases and the finer lines on the toes correspond to, but are not so well marked as, those found on the fingers. The finer lines on the sole start from the heel and pass in wide curves to the margin of the foot: those on the outer side to the outer margin; those in the centre forward with a slight general inclination inward; and those on the inner side forward and inward to the cleft between the sole and great toe. This same arrangement is reproduced on a smaller scale on the skin of the ball of the great toe.

The description of the finger-nails applies equally to the toe-nails. The ungual phalanges of the toes were, if anything, a trifle more bulbous than those of the fingers.

From my account it is clear that there is much less resemblance between a man's and a gibbon's foot than there is between their hands. In fact, of the hand and foot of the gibbon, it is the latter which more closely resembles the human hand. The central digit of the ape's foot and hand corresponds to the central digit of the human hand, namely the third, while the central digit of the human foot is the second. The marked difference between the hand and foot of man is due to specialization. Man uses his hand, said Goodsir, "as an instrument for acting on matter, in the terms of his human faculty of thinking in space"; while his foot is an organ merely of support and progression. Commonly all other functions are precluded, for the foot is enclosed in a boot. But among peoples, such as the natives of India,

where custom does not confine the feet in coverings, the human foot retains a certain amount of its prehensile power. In the ape the foot is far superior to the hand as a prehensile organ, for not only is the hallux better developed than the pollex, but it has much greater power to oppose the other digits. Grasping and progression in animals of arboreal habits are to some extent synonymous. In the human foot the hallux is so bound up with the rest of the foot that it is practically incapable of any independent action.

References.

- [1] 'Anatomical Memoirs of John Goodsir.' Vol. I. Edited by W. Turner.
 [2] 'Journal of Anatomy and Physiology,' 1893.

EXPLANATION OF PLATE V.

- Fig. 1. A, hand, B, foot of *Hylobates agilis*, to show the arrangement of the creases. Owing to the hook-like position of the hand, the finger-tips are out of focus.
 Fig. 2. Skin from the palmar aspect of the fingers, to show the chevron-like arrangement of the fine lines.

XXVI.—On Neotropical Mammals of the Genera *Callicebus*, *Reithrodontomys*, *Ctenomys*, *Dasypus*, and *Marmosa*. By OLDFIELD THOMAS.

Callicebus pallescens, sp. n.

Allied to *C. donacophilus*, d'Orb., with which it shares the greyish-white hands, feet, and tail, but the head and body are almost of the same pale colour, so that the whole animal is one of the palest and most uniformly coloured species of the group.

Size very small. Fur thick and soft; the longer hairs of back about 60, the shorter 35 mm. in length. General colour of body pale greyish, suffused with pinkish buff; the long hairs indistinctly ringed with whitish and black, the underfur pinkish buff for its terminal half, its basal half dark brown. Under surface and inner side of limbs rufous, rather paler than in *C. donacophilus*. Head rather yellower than back, owing to the hairs being tipped with yellow, but the difference is not conspicuous. Muzzle and lips whitish. Hands and feet greyish white. Tail also greyish white, but the hairs inconspicuously ringed with blackish.

Skull chiefly remarkable for its small size as compared with that of any other species.

Dimensions of the type (measured on skin) :—

Head and body 365 mm.; tail 390; hind foot 84.

Skull: greatest length 58·5; basal length 44·5; zygomatic breadth 39; mastoid breadth 34·3; front of canine to back of m^3 18·2.

Hab. Chaco of Paraguay; type from 30 miles N. of Concepcion.

Type. Male. B.M. no. 94. 3. 6. 1. Collected October 1893 by Dr. J. Bohls. Two specimens.

In the absence of fresh specimens of *C. donacophilus* these skins from Paraguay were provisionally referred to that species. Now, however, a series of skins from Bolivia, collected by Mr. Steinbach, and nearly topotypical of d'Orbigny's species, prove conclusively that the present form needs description. Its differential characters are given above.

Grisson * *furax*, sp. n.

One of the smaller species of the group, of a strongly yellowish colour.

General colour comparatively yellow or buffy, the facial streaks and the ends of the dorsal hairs buffy or buffy ochraceous, the lateral streak behind the ear more deeply ochraceous. Underfur of back brown, darkening terminally. Under surface and limbs wholly black, the belly without any light tipping. Tail-hairs brown basally, broadly tipped with buffy ochraceous; parted on the upper surface in such a way as to show a narrow, median, ochraceous-buffy line along the centre, composed entirely of short woolly hairs.

Skull with the carnassials and molars of medium proportions, the lower carnassial without a supplementary internal cusp.

Dimensions of the type (not fully adult) :—

Head and body 317 mm.; tail 110; hind foot 54; ear 22.

Skull: basal length 60; greatest breadth 37; length of p^4 on outer edge 7·5; greatest diameter of m^1 6·3.

Hab. Southern Brazil. *Type* from San Francisco dos Campos, S. Minas Geraes. Altitude 1580 m.

Type. Immature male. B.M. no. 1. 6. 6. 25. Original number 622. Collected 29th March, 1901, by Alphonse Robert.

This is the common Grison or "Furão" of Southern Brazil, generally known by the name of "*Galictis vittata*";

* Oken, 1816. Better known as *Galictis*.

but it seems to be without a name properly applicable to it. The *Viverra vittata* of Schreber was based on a Surinam animal, probably one of the group with a supplementary cusp on the lower carnassial, and certainly not the present form, to which its name has been so commonly applied. Thunberg's *Ursus brasiliensis* is, again, clearly the larger type of this group, and would appear to be the same as Nehring's *Galictis crassidens*.

The Chilian *G. cuja*, Mol. (syn. *G. quiqui*, Mol.), agrees with *G. furax* in the essential characters of size and tooth-structure, but in colour is much greyer, the buffy parts of *G. furax* being replaced by white or whitish.

Grison furax luteolus, subsp. n.

Similar to true *furax*, but paler throughout.

Size and general characters as in *G. furax*, but the facial bands, the tips of the dorsal and caudal hairs, and the pale short-haired line along the top of the tail are all much paler in colour, being approximately "cream-buff" instead of ochraceous buff. Underfur dull whitish buff, giving a conspicuously paler tone to the whole animal. Hairs of belly tipped with pale buffy, the throat, chest, inguinal region, and limbs being, as usual, black. Extreme tip of tail with a small tuft of white hairs. Four pairs of mammae, all inguinal.

Dimensions of the type (measured in flesh):—

Head and body 380 mm.; tail 170; hind foot 60; ear 22.

Skull: basal length 66.5; greatest breadth 41.3; mastoid breadth 37.5; palatal length 33; length of p^1 on outer side 7.1; greatest diameter of m^1 5.2.

Hab. Chulumani, Bolivia, 67° W., 16° S. Alt. 1800 m.

Type. Old female. B.M. no. 1. 6. 7. 27. Original number 1305. Collected 31st December, 1900, by Perry O. Simons; presented by Oldfield Thomas.

This form may be readily distinguished from the Brazilian animal by its more creamy-buff colour, and especially by its light underfur.

Reithrodontomys modestus, sp. n.

A small species of dark colour, with a short and uniformly dark tail.

Size about as in *R. saturatus*. General colour dark, nearest to Ridgway's bistre, the sides more drabby, the dorsal area rather blacker. Under surface soiled greyish (grey no. 6), not sharply defined, the bases of the hairs blackish slate; a large patch between the fore limbs drab, like the lower flanks. Ears short, uniformly blackish. Upper surface of hands

white, of feet dull white with a darker area along the outer side of the metatarsus, but this area is not sharply contrasted as is sometimes the case. Tail little longer than the head and body, well-haired, uniformly blackish above and below, the proximal inch below only inconspicuously lighter.

Skull thin and papery, without strong ridges. Palatal foramina reaching to the level of the second lamina of m^1 . Bullæ comparatively small.

Dimensions of the type (measured in the flesh):—

Head and body 59 mm.; tail 70; hind foot (s. u.) 16.5; ear 12.5.

Skull: greatest length 21; basilar length 15; length of nasals 7.8; interorbital breadth 3.5; breadth of brain-case 10.5; palatal foramina 4.6; length of upper molar series 3.3.

Hab. Jinotega, Nicaragua. Altitude 4650'.

Type. Adult male. Original number 29. Collected 20th January, 1906, by Mr. M. G. Palmer.

This *Reithrodontomys* is distinguishable by its small size, short ears, dull coloration, and short unicolor tail.

Mr. W. H. Osgood has been kind enough to compare this mouse with the specimens in the U.S. Department of Agriculture collection, and he tells me that it does not appear to resemble very closely any of the species there. "It is, perhaps, nearest to *R. australis* of Costa Rica, but is darker on the upper parts, slightly smaller, and the tail is shorter and more nearly unicolor."

Ctenomys Steinbachi, sp. n.

A fairly large species, of a uniform coppery-grey colour.

Size rather above the average in the genus. Fur straight, fine and glossy; hairs of back about 13 mm. in length. General colour a peculiar dark drabby grey-brown or coppery, quite unlike that of any known *Ctenomys*, but very similar to that of certain Geomyidæ, e. g. *Zygogeomys trichopus*, Merriam. This colour is quite uniform over the whole of the head, upper surface, and sides. Under surface creamy white, the hairs dull slaty for their basal two thirds; line of demarcation on sides fairly sharply defined. Whiskers white. Chin and a band across the lower neck in front of the arms brown, separated by a broad whitish patch running across the interramial region and narrowing on the sides to a point about half an inch below each ear. Arms and legs light-coloured, except a narrow band running down the front of the forearms; hands and feet almost naked above, pale brown, the lateral fringes whitish. Tail very thinly clothed, its sparse hairs dull white.

Dimensions (taken on the skin) :—

Head and body 245 mm.; tail 86; hind foot, s. u. 41, c. u. 45.

Hab. Campo of Province Sara, near Santa Cruz de la Sierra, Bolivia.

Type. Adult male. Collected by Mr. J. Steinbach.

This striking species differs so widely in its coloration from every known *Utenomys* that even in the absence of the skull I have no hesitation in describing it as new. Its colour above is extraordinarily like that of *Zygogeomys trichopus* and some other Geomyidae, which have a similar coppery-brown tone, while all the hitherto known *Utenomys* are of some fawn or buffy tint.

A baby specimen of *Ct. Steinbachi*, only 100 mm. in length, is of precisely the same colour as the adult.

The Local Forms of Dasypus sexcinctus, Linn.

While the extreme forms of the *Dasypus sexcinctus* group are, as shown in a former paper *, so widely different in size that it seems impossible for them to belong to the same species, further material from intermediate localities tends to fill up the gap between them, and I am now disposed to regard them as forming but a single species with several geographical races.

These races may be briefly distinguished as follows :—

1. Size smallest; greatest skull-length 95 mm., cephalic shield in an average specimen 87×65. Colour brown. About 31-33 scales in movable bands. Back thinly haired, the pelvic shield practically naked. (Para.) *D. sexcinctus sexcinctus*, [Linn.]
2. Size medium; greatest skull-length of adult 114 mm., cephalic shield about 103×77. Colour paler, more yellow. Hairs as in *sexcinctus*. (Bahia.) *D. s. setosus*, Wied.
3. Size largest; greatest skull-length attaining 126 mm., cephalic shield 123×88. Colour brown. Hairs as in *sexcinctus*. (Matto Grosso, Paraguay, and South Brazil.) *D. s. gilvipes*, Ill.
4. Size rather less than in *gilvipes*; cephalic shield 114×89 mm. Colour pale horny. Movable bands with 36 scales. Back scantily haired. Skull short and broad; molars broad and rounded. (Bolivia.) *D. s. boliviæ*, subsp. n.
5. Size as in *boliviæ*; cephalic shield 116×78 mm. Colour sandy. 36 scales in movable bands. Back well haired, the pelvic shield with many white hairs. Nasals rather peculiar in shape. (Tucuman.) *D. s. tucumanus*, [subsp. n.]

* P. Z. S. 1903, ii. p. 242.

The new forms may be more fully described as follows:—

Dasypus sexcinctus boliviæ, subsp. n.

Size rather less than in *gilvipes*. Colour pale; hairs of carapace white, of soft parts brown, nowhere really black. Hairs not more numerous than in *gilvipes*, the scales of the movable bands each with a couple of white bristles about 2–4 cm. long at their posterior end; pelvic shield almost naked, its few bristles rarely more than 1 cm. in length. Scales more numerous than in the Eastern forms, the median movable bands consisting of 36 scales. Frontal shield very broad in proportion to its length.

Skull broad and stout, with broadly and abruptly expanded zygomata. Frontal region but little convex. Nasals nearly parallel-sided, not of the peculiar shape found in *tucumanus*. Palate broader. Molars more broadly rounded, the fifth maxillary tooth 6.4×4.7 mm.

Dimensions of the type (measured on the flattened skin):—

Head and body 500 mm.; tail 250.

Frontal shield 114×89 .

Skull: condylo-nasal length 119; basal length 100.5; zygomatic breadth 75; nasals, length 43.3, breadth anteriorly 13, mesially 18.3, posteriorly 20; palatal length 68; breadth of palate between fifth maxillary teeth 16.4.

Hab. Near Santa Cruz de la Sierra, Bolivia.

Type. Old male. Original number 139. Collected 17th May, 1906, by Mr. J. Steinbach; presented by Oldfield Thomas. One specimen.

The pale colour and more numerous scales ally this form to the next subspecies, while it resembles *D. s. gilvipes* in its scantily haired pelvic shield. Its very broad and rather flattened skull is peculiar to itself.

Dasypus sexcinctus tucumanus, subsp. n.

Size rather less than in the large Paraguayan *D. s. gilvipes*. Colour paler, the carapace itself sandy, its hairs white. These latter are fairly numerous both on the movable bands and on the pelvic shield, and attain from 3–5 cm. in length along the sides. Scattered hairs of underparts, arms, and legs mostly black, with a few whitish ones intermingled. Scales of carapace rather smaller than in the Eastern forms, there being 33–36 scales on each of the movable bands, the numbers on the shoulder and pelvic shields proportionally increased.

Nasals narrow in front and behind, angularly broad in the

middle, the middle part projecting outwards on each side in an angle at the premaxillo-maxillary suture. Posterior narial opening narrow, the notch sharply V-shaped. Teeth narrow throughout, the fifth maxillary tooth 6.2×4.2 mm.

Dimensions of the type (as taken by collector in the flesh) :—

Head and body 410 mm. ; tail 230.

Cephalic shield 116×78 .

Skull: back of frontals to end of nasals 85; greatest breadth 64; nasals, length 40, breadth, anteriorly 11, in middle 19, posteriorly 12.5; palatal length 64; breadth of palate between fifth maxillary teeth 13.3.

Hab. Tapia, Tucuman. Alt. 700 m.

Type. Adult male. B.M. no. 3. 6. 6. 16. Original number 1910. Collected 23rd September, 1902, by L. Dinelli; presented by Oldfield Thomas. Two specimens examined.

Marmosa chloe, sp. n.

A small dark-coloured species, with creamy chest and inguinal region.

Size about as in *M. fuscata*, Thos., and *M. Klagesi*, All. Fur soft and fine; hairs of back about 6 mm. in length. General colour above sepia along the dorsal area, shading off into bistre on the sides. Under surface, on throat, chest, and inguinal region, pale pinkish or creamy buff, the hairs this colour to their bases; but on the belly the slaty-based hairs encroach on each side, so as to narrow the creamy part to a mere median line. Sides of face with a large ill-defined black patch surrounding the eyes, the paler area between them less marked than in *Klagesi*. Lower cheeks cream-buff. Ears naked, dark grey. Hands pale brown, feet whitish. Tail with its short-haired part about half an inch in length, the remainder naked, uniformly pale grey.

Skull shaped very much as in *M. Klagesi*; similarly broad, with expanded zygomata and fairly well defined supra-orbital ledges. Nasals expanded posteriorly.

Dimensions of the type (measured in the flesh) :—

Head and body 143 mm. ; tail 170; hind foot 21; ear 19.

Skull: greatest length 33.7; basal length 30; greatest breadth 18; nasals 14×4 ; interorbital breadth 5.2; breadth of brain-case 13.5; palate, length 18.2, breadth outside m^3 10.5; combined length of three anterior molariform teeth 5.6.

Hab. Demerara River, 29 miles above Georgetown, British Guiana.

Type. Male. Original number 13. Collected 6th December, 1906, by Mr. S. B. Warren.

This species is very much darker throughout than *M. Klagesi*, to which it appears to be most nearly allied. The similarly dark *M. fuscata* has a wholly grey-mixed belly and a much more elongate skull, without trace of supraorbital beads.

BIBLIOGRAPHICAL NOTICE.

Catalogue of the Madreporarian Corals in the British Museum (Natural History). Vol. VI. By H. M. BERNARD, M.A.
London: Printed by Order of the Trustees of the British Museum, 1906.

IN this volume Mr. Bernard completes the description of the genus *Porites* and gives also a descriptive list of the genus *Goniopora* supplementary to that given in vol. iv.

Besides the Corals there are probably few groups in the animal kingdom which present such formidable difficulties to the taxonomist and morphologist alike—difficulties which at the present moment appear to defy solution. Mr. Bernard, who has devoted to this group many years of patient study, has, however, certainly laid the foundations of a more exact knowledge of coral-forming animals, and has at the same time brought to light some important evidence with regard to the effect of isolation and the influence of environment on living organisms, more especially with regard to sessile forms.

The Author has, however, so it seems to us, become entangled in the toils of that seductive question, What is a species? Dissatisfied with our present definition, and unable to supply any better, he has endeavoured to compromise. We venture to think, however, that his suggestion will not be favourably received.

Recognizing a number of local forms in the several genera which he has so far examined, he proposes to regard these not as so many geographical races to be distinguished by trinomial specific names, but as indeterminate incipient species, which are to be distinguished by numerals. So that we get such names as *Goniopora Queenslandiae quintadecima*, *Goniopora Australiae occidentalis septima*, *Porites incertae sedis quartadecima*!!

However, in spite of this positive drawback, Mr. Bernard has contrived to bring together a mass of most valuable information, which will prove of great value not merely to the students of corals, but also to those who are interested in the study of animal life in general.

The plates which illustrate the volume are of great beauty.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 117. SEPTEMBER 1907.

XXVII.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XXVIII. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c.

[Plates VI.-VIII.]

1. On a Porbeagle Shark with a large Suboral Aperture.
2. On the Young of the Ling.
3. On a large Example of *Ommastrephes sagittatus*, d'Orb.
4. On *Genetyllis citrina*, a new Phyllodocid.
5. On the Reproduction of *Nereis diversicolor*, O. F. Müller.

1. *On a Porbeagle Shark with a large Suboral Aperture.*

The number of porbeagle sharks caught in the gill-nets of the fishermen in St. Andrews Bay has been a subject of remark in former notes, and as time advances they do not appear to be diminishing. A female 9 feet long and in a very healthy condition entangled itself in the gill-nets for cod last November, and as the fishermen stated that it had two mouths, it was brought to the Laboratory. Inspection showed that all the internal organs were in a normal state. At a distance of 5 inches behind the tip of the mandible is a large aperture (Pl. VI. fig. 1, *a*), with a smoothly cicatrized margin, measuring in the preserved specimen 4 inches in transverse diameter, and blocked inferiorly by the basihyal, covered with cicatrized

skin and freely movable with the branchial apparatus. The truncated tip of the basihyal is marked by various hard wrinkles, and it projects from the ventral surface a considerable distance in profile (Pl. VI. fig. 3). When the hyoidean apparatus is pushed forward the blunt tip has a tendency to close the aperture.

Viewed internally (Pl. VI. fig. 2) the basihyal is depressed, much of it passing into the aperture in the floor of the mouth and projecting ventrally. The ceratohyals are nearly normal or only very slightly lowered. In the fresh specimen the movements of the parts were quite free, as in an ordinary example, and apparently prehension and deglutition were unimpaired.

So far as observation goes, it would seem that the fish had at one time been captured by a powerful shark-hook which had struck it from below and pierced the basihyal and the soft parts near it. In its struggles it probably wrenched the tip of the basihyal, which, with the soft parts, gave way under the powerful strain, so that about 2 inches of the basihyal with the tip of the tongue were lost and a large gap externally was caused. Whether the hook remained a short or a long time in the wound would depend on the soundness of the tackle. Though the whole hyoidean apparatus must have received a considerable wrench, yet the healing and contraction of the wound and the cicatrization of the coverings of the depressed basihyal have been so complete that comparatively little inconvenience has resulted. The large ventral aperture would take in water, whilst the plug of the basihyal would prevent the loss of food. Moreover, swallowing would not be interfered with. The slender gill-nets prove more deadly to such a powerful fish than a hook, for they yield on every side, and, though torn, soon envelop fins and tail and impede branchial respiration. On the other hand, it is comparatively rare for such a form to envelop itself with the lines, from which this shark is an adept at picking off the fishes after they are hooked.

As indicated elsewhere, the porbeagle shark has never been known to attack the human subject, yet the great muscular power and weight of an example measuring 9 feet and the length and sharpness of its teeth undoubtedly fit it for any predatory function. If by chance it acquired such a habit, and was as common in St. Andrews Bay in the warmer months as it is in the cold, those who swim in the inshore waters would have to face a new danger.

2. *On the Young of the Ling (Molva molva, L.).*

J. Schmidt *, as the result of the recent unequalled international opportunities for obtaining the early stages of the food-fishes, gives an account of the pelagic postlarval stages of the ling. Yet he has only procured a single example 5 mm. longer than that described and figured in the 'Researches' †, and which really adds little to our knowledge, since the pigment forming the commencement of the longitudinal band characteristic of the later stage of $3\frac{1}{2}$ inches is already indicated in the memoir cited. The $3\frac{1}{2}$ -inch stage has not been procured by the Danish author, his figure having been taken from the 'Researches.' He seems to be in doubt as to the passage of this longitudinally striped form into the transversely barred one found at the rocks near the pier at St. Andrews, since this coloration is diagnostic of the postlarval stages of the blue ling (*Molva byrkelange*, Walb.), a deep-sea form. Now only one species of ling frequents the eastern shores of Scotland, the eggs and young of which were long ago described at St. Andrews. Moreover, there is little doubt that the longitudinally striped stage of $3\frac{1}{2}$ inches by-and-by changes into a transversely barred one with blotches along the sides. Moreover, at $13\frac{1}{2}$ inches the coloration remains very much as at the 9-inch stage described in the 'Researches.' The golden colour of the pectorals and the pallor of the ventrals are the same, the median division of the tip of the latter, however, being larger and broader. The barbel has additional black pigment. Perhaps the pigment-bars on the tail are less bold, though the margin is still white. In general outline the chief change, in comparison with the 9-inch stage, is the elongation of the snout in front of the eyes, the spaces between the eyes and the nostril and between the latter and the tip of the snout having increased. This example was procured in May, and is probably about six months older than the 9-inch stage; and as the barred condition is assumed in all probability in its second year, the rate of growth given in the 'British Food-Fishes' ‡ may be too rapid.

Schmidt's hesitation in believing that a longitudinally striped young ling of $3\frac{1}{2}$ inches subsequently becomes transformed into a fish with bold transverse bars is natural.

* Meddel. fra Komm. for Havunder. Serie Fiskeri, Bd. ii. no. 3 (1906).

† Trans. R. S. Edin. vol. xxxv. p. 830, pl. xvii. fig. 4.

‡ McIntosh & Masterman, p. 283.

There is, however, no reason to doubt it, (1) because no smaller form with transverse bars is known at St. Andrews; (2) because all the examples (and they are many) above this size are transversely barred, the blotches remaining even to the size ($13\frac{1}{2}$ in.) already indicated; (3) because no other species of ling has hitherto been found in the neighbouring waters.

The above writer, in criticizing the figure of the early ling in the 'Researches'*, had forgotten to look at the text. The outline of these delicate young forms is considerably altered by strong alcohol, and whether a slip had occurred in Prof. Prince's figure or in the work of the lithographer it is now difficult to determine. At any rate, it is clearly stated in the text that "the notochord passes almost in a straight line backward to the tip of the tail, and the caudal fin is continuous with the unbroken marginal fin dorsally and ventrally. The great development of the ventral or permanent rays, however, slightly pushes the tip with the embryonic radial striations upward. The hypurals, two of which are very distinct, are developing inferiorly, and the epiurals dorsally, but they have only slightly affected the direction of the notochord. The early development of the upper caudal rays in this form is of interest, as it is in marked contrast with such forms as the *Pleuronectidæ*, in which the inferior fin-rays alone appear." A re-examination of the specimen in the University Museum bears out the accuracy of this description, and shows that the slightly tapered tip of the notochord projects backward nearly in the centre of the caudal rays, which are now taking the place of the embryonic fin-rays. The hypural and epiural elements are clearly visible. There is nothing in the preparation to cause any confusion with the condition in a *Pleuronectid*, from which the pelvic fins alone would at once distinguish the young ling.

3. *On a large Example of Ommastrephes sagittatus, d'Orb.*

Information was given by Mr. Andrew Brown, of Queen's Gardens, St. Andrews, early in January of the stranding of a large cuttlefish at the East Rocks, near the Rock and Spindle. It had, unfortunately, been much destroyed by birds before it was seen—the tentacles, funnel, all the viscera, beaks, and even a large part of the muscles of the mantle having been removed. A glance at the specimen showed that

* Trans. R. S. Edin. vol. xxxv.

it was of unusual size, no similar form having been met with for forty years, when a somewhat smaller example (mantle 20 inches and tentacles 3 feet) was procured on the beach. The visits of the swarms of smaller squids which prove so troublesome to the liners are as uncertain, one having been noted in 1885 and the last in 1891 *. On the last-mentioned occasion a vast number took possession of the ground between the Bell Rock and St. Andrews, entered the latter, and even filled the salmon stake-nets, though most escaped through the meshes when the nets were hauled. Very large squids in British waters appear to be rare, one slightly larger than the present example having been described by Dr. Goodrich †, and two are mentioned by him as in the British Museum. Foreign specimens of great size are well known, especially on the American coasts ‡. A gigantic one was seen in 1876, when a Scotch herring-boat, containing amongst others the attendant at the Laboratory (A. W. Brown), leaving Howth Point, was summoned by the cries of the occupants of a diver's boat. They found the diver, who had been surveying a sunken tug off St. John's Point, on the ladder, to which he had been hauled (as no signal had been made for some time), with his arms pinioned by a huge cuttlefish. The men rapidly cut the diver free and allowed the cuttlefish to escape. Their impression was that the body of the cuttlefish was about a foot in diameter and the arms about 7 or 8 feet in length §.

In the present mangled example now in the University Museum the length of the mantle from the tip of the tail to the collar is 25 inches. The caudal fin is 11 inches from the apex to the centre, $11\frac{3}{4}$ inches along the outer slopes, and fully 10 inches across the base on each side, though the latter is probably underestimated, as the central portion had been lacerated by the gulls. The total breadth of the base of the caudal is thus more than 20 inches. The tentacles are absent, but the eight arms have an average length of $13\frac{1}{4}$ inches, and the breadth of the winged or keeled arm is fully $2\frac{1}{2}$ inches. The pen, characterized by its great strength and stiffness, is in fragments, but when laid carefully together it measures 23 inches, though in all probability in its complete condition

* Fourth Ann. Rep. Scotch Fishery Board (1885), p. 204, and Tenth Report (1891), part iii. p. 299.

† Journ. Mar. Biol. Assoc. vol. ii. n. s. p. 314 (1893).

‡ An interesting account of one of these is given by Prof. D'Arcy Thompson, Proc. Zool. Soc., Dec. 18, 1900, p. 992.

§ Part of an arm was secured for Glasgow Museum, but Prof. Graham Kerr, who kindly made a search lately, could find no trace of it.

it approaches 25 inches. The size of the terminal pocket, in contrast with that of a specimen with a body $15\frac{1}{2}$ inches long, is great, viz. 17 mm. in depth at the proximal edge, and from that to the flexible tip 20 mm. It is marked by the usual ridges.

The description of the arms by Dr. Goodrich would do fairly for the present specimen, the latero-ventral frill of the third right arm (Pl. VII. fig. 1) being conspicuous, and at its distal third, the widest portion, is at least an inch and a half in breadth. As mentioned by Dr. Goodrich, it is supported by thick ridges. Each arm has two rows of suckers (Pl. VII. fig. 2), which differ from those described and figured by Goodrich, but agree with those of the common *Ommastrephes sagittatus*, and this is confirmed by Dr. Hoyle, who kindly examined both the example and its suckers, and to whom I am indebted for much information. The largest suckers on the arms measure 15 mm. over all, and the aperture with the teeth 10 mm. *in situ*. The proximal half of the rim (as it lies on the arm) has a series of small teeth, whilst the distal half has larger recurved teeth, the whole surrounded by the mobile muscular investment. The central cushion is attached to the tough pedicle. When removed from its investment (Pl. VII. fig. 3) the horny rim is distinctly oblique, the edge trending from the large teeth forming a long hoof-like process which apparently gives a larger surface for its attachment. The arrangement of the teeth on the rim is more or less uniform (Pl. VII. fig. 3), viz. a median very large tooth, often more or less blunted by use, and two or three somewhat smaller teeth on each side, the points of these being very sharp. Occasionally a smaller tooth occurs between the lateral teeth of one side. The teeth spring from a thickened horny rim and are sheathed externally in a hard, glistening, pale yellow substance, which appears to perform the part of enamel. So far as could be seen, no fold supporting horny plates existed round the outer margin. As the tentacles were absent nothing can be said about their suckers, but they must have been of large size, and probably with a more or less even series of teeth, as in the smaller examples.

In a specimen which has a mantle about a foot in length, and which has a diameter at its widest part of 3 inches, the arms range from 7- $7\frac{1}{2}$ inches in spirit, the third right arm having a keel, which, however, is but slightly developed in contrast with the old example. The tentacles are 10-11 inches in length and bear larger suckers than on the arms. The length of the caudal fin along its outer edge is $4\frac{1}{2}$ inches.

Such forms a useful contrast with the large specimen, which seems to have successfully eluded the agencies which, as a rule, render examples of this size rare on our shores, though, perhaps, abundant in the deeper waters.

4. *On Genetyllis citrina, a new Phyllodocid.*

This form was procured on a stone—coated with corallines, a bright yellow sponge, and several ascidians—brought up by a fisherman's hook in the Minch in 1865.

The head is rounded ovate, with two black eyes of considerable size. The four tentacles had been removed, but they probably resemble those of *G. lutea*. The tentacular cirri are similarly arranged, viz., two shorter anteriorly and two longer posteriorly. Body about 3 inches in length, much tapered anteriorly. Posteriorly it terminates in two caudal cirri. The dorsal surface is convex, the ventral marked by two elevated ridges on each side of a slightly depressed central area. The entire animal is of a most brilliant chrome-yellow—deepest on the middle third, which here and there showed blackish-brown patches on the lamellæ (cirri). It tinged the water with a yellowish mucus, and also dyed the spirit in which it was immersed of the same hue.

The dorsal region of the foot has a massive, short, bluntly conical process devoid of spine or bristles, and bearing the unequally cordate lamella (cirrus), which is marked by a series of lines and reticulations from a central rib. The imbricate lamellæ are borne more or less horizontally along the sides of the dorsum, leaving the central region bare. The semicircular gap at the base of the lamella fits the rounded extremity of the division to which it is attached. The short setigerous region is bifid at the tip and supported by a black spine, and a group of bristles shorter than in *G. lutea*, the translucent shafts being slightly bent, and with a dilated distal end which has a few spikes on each side. The terminal process is finely tapered and shorter than in *G. lutea*. The edge shows no distinct serrations, though the adherence of particles would indicate them. Attached to the ventral and posterior part of the region is an irregularly reniform ventral cirrus, vertical in position. The inferior border is rounded, but the superior is truncated, with a tendency to a point at the upper and outer angle. The cirri—both superior and inferior—vary little in shape throughout the body.

The stone was coated with the yellowish sponge, but its connection with habits of the *Genetyllis* is unknown. The

annelid crawled actively amongst the ascidians and other growths to escape capture.

This form clearly approaches *Genetyllis lutea*, Malmgren, but the setigerous region supported by a black spine and carrying shorter bristles with shorter terminal processes than in that species point to separation.

5. *On the Reproduction of Nereis diversicolor*, O. F. Müller.

Various statements have been made about the reproduction of this species. Thus Max Schultze* refers to the occurrence of the young in the body-cavity, having apparently considered Koch's statements in regard to *Marphysa sanguinea* as true.

Cuvier and Grube, again, thought *Arenicola* was hermaphrodite, and Rathke placed *Amphitrite* in the same category, though each might be more or less male or female. An interesting résumé of the views of the period is given by Frey and Leuckart †. A. Krohn, again, describes from Nice a viviparous *Syllis* (*S. vivipara*) allied to *S. Armandi*, only the new form has simple tips to the terminal pieces of the bristles. The enclosed young form has 23 segments and is like the adult.

In Balfour's 'Embryology' ‡ it is stated that "a few forms (e. g., *Eunice sanguinea*, *Syllis vivipara*, and *Nereis diversicolor*) are viviparous." Considerable reliance in more recent times has been placed on the observations of Mendthal on the supposed hermaphroditism of *Nereis diversicolor*. This author seems to have been attracted to the subject by the previous work of Schröder §, who found embryos in the morula-stage. Mendthal described the species from the bay of Pillau as carrying both eggs and testes in June, and he was the more inclined to believe in its hermaphroditism since Schröder met with only 3 males out of 48 examples. He places and figures the testes in the dorsal region as pear- or flask-shaped masses to the exterior of the dorsal longitudinal muscles. The supposed testes, therefore, occupy the same position as the outer limb of Dr. Goodrich's dorsal organ, and it may be that the cilia were a source of misapprehension. On the other hand, he describes the ova as developing at the bases of the feet, the figure representing them in the position of the segmental organ.

* 'Entwicklung *Arenicola piscatorum* &c.,' p. 214 (Halle, 1856).

† Beitr. z. Kenntniss wirb. Thiere, p. 82 (1847).

‡ Vol. i. p. 319.

§ This author's paper has not yet been obtainable.

De St. Joseph, however, could not corroborate the foregoing observations. Gravier, on the other hand, considers that hermaphroditism and viviparity may exceptionally exist in this form, and in the 'Cambridge Natural History' it is stated that viviparity is characteristic of it.

The annelid is very common on many parts of the British shores, burrowing in clay, sand, mud, peat, and similar media, and at St. Andrews it abounds at the upper end of the harbour amidst muddy clay on the sides of the Kinness Burn which enters there. During last winter especially careful observation of the species was carried out to test the condition as regards reproduction; yet though both hermaphroditism and viviparity have been discountenanced, it has not been possible to find the worm either discharging from its tunnel in the mud its eggs and sperms or becoming pelagic at maturity and thus dispersing the sexual elements. So far as can be observed, the former, perhaps, seems to be the more likely, though no certainty exists on this head.

In the middle of October the majority of the examples—both large and small—were females with fairly developed ova, which were almost visible to the naked eye and easily under a lens. In these the vascularity of the feet had slightly increased, but no change in the lobes of the feet or in the bristles had occurred. Amongst the ova in the coelomic space were numerous pale granular cells, apparently modified perivisceral corpuscles. Very few males were obtained at this time, and these for the most part were undeveloped.

In November comparatively few ova were attached to the ventral plexuses, most being free in the perivisceral space. On the other hand, the vascular plexuses in the region of the ciliated organ were laden with dense groups of rather coarsely granular cells—sometimes in lobular masses, and it was considered that these pale cells were associated with the growth and maturation of the ova in the coelomic space. The ova had considerably increased in size towards the end of the month.

In transverse section* the body of the annelid at this time differed little from the type except in the presence of ova, which appear most abundantly, in the sections, at the bases of the feet and extending into their lobes. The number in the coelom was not large, many, in all probability, having fallen out. The dorsal and ventral longitudinal muscles showed little change, the pennate fold of the latter being well

* I am indebted to Dr. Tosh for valued aid in making these sections and in other respects.

developed. The oblique muscles pass at each side slightly below the nerve-cord to be attached to the basement-membrane; and at least three neural canals are present, the larger lateral having a coagulable fluid internally, and each runs along the outer border of the nerve-trunk between the pairs of ganglia. The median or dorsal canal, again, appears to have a separate strand in the interganglionic region, and when it reaches the ganglia it splits into two trunks in certain sections. The muscles of the bases of the feet and of the bristles are also strong. The wall of the alimentary canal appears to be of normal thickness.

The annelids remained very much in the same condition during December, the great majority of those examined being females, so much so that it was at first considered probable that, as authors had stated, a complex sexual condition existed (*e. g.* alternate development of the reproductive elements); but as a few males were still met with and no trace of an intermediate stage occurred, such complexity could not be proved. This month the only difference in the sections of the females was the increase in the size of the ova, the abundance of the cœlomic corpuscles (Pl. VIII. fig. 1), and the distention of the body-cavity and the bases of the feet, so that the muscles of the wall were stretched. The vascularity of the outer surface of the gut also appeared to be increased. The segmental organs showed no feature of note. In the males the perivisceral cavity and the bases of the feet contained dense masses of translucent granular cells, the large nuclei of which stained deeply with eosine.

The great increase of the large granular cells (Pl. VIII. fig. 3) in the cœlomic cavity in January was a feature of moment, especially in those females in which the ova were small. The enormous masses of these cells distended the bodies of the females and they probably increased by division, each being filled with spherules. In glancing at the living annelids a pale, or greyish, green hue characterized the posterior region of the body in the females; whilst the anterior segments had their vascularity increased, the dorsal vessel of the foot and its branches especially were distinct. When the posterior region was punctured, the masses of ova had a pale greenish colour as in the previous months, and were similarly unfertilized. As many have discharged ova, it would appear that fertilization is external as in allied forms.

The sexes are not always distinguished by colour, both males and females being greenish or dull yellowish, though the males are often paler. No change in eyes, feet, or

bristles is apparent. In many an opaque, dull whitish condition occurs in the anterior feet, which are filled with the large granular perivisceral corpuscles. Moreover, almost all have a touch of white at the base of the dorsal cirrus—from one end of the body to the other, a similar touch occurring at the tip of the ceratophore of each tentacular cirrus.

Mendthal* figures two examples, one of the general brownish-orange hue of the ordinary type, and the other of this colour in the anterior fourth, whilst the rest is of a grass-green tint. He considers that the latter (green) colour is due to a diet of green algæ, a condition which is not in accordance with the observations at St. Andrews, where the greenish hue appeared to be the result of the presence of masses of more or less ripe ova. There is no reason, however, why a diet of *Ulva* or other green alga should not tint the digestive canal green.

In the male the sperm-cells (Pl. VIII. fig. 2) filled the various cavities even to the bases of the dorsal cirri throughout January, but though the body-wall was frequently distended, no degeneration of the muscular bands could be observed. In the females the size and abundance of the ova in particular examples varied, but, as a rule, the granular ova with a slightly stained nucleus and a more deeply stained nucleolus were more or less advanced towards maturity. Occasionally an example with few and small ova appeared. In some of these the muscular walls of the body were contracted, and very few ova, and these of small size, occurred in the perivisceral space. More frequently they were found in the feet. Masses of ovigerous tissue were attached to the vessels near the bases of the latter; and cellular masses (it may be parts of the dorsal organ) with boldly stained nuclei passed upward at the bases of the feet within, as well as without, the lateral lobe of the dorsal longitudinal muscles, and similar cells passed into all the spaces of the feet—in specimens having a considerable number of large ova. These loose cœlomic masses probably represented the cells alluded to in the living forms.

In February the increase in size and the division of the sperm-cells formed the most noteworthy feature, but no free sperms were seen. In the other sex the ova in many had considerably increased in size, and from the appearance of the annelids a large number of ova must have been discharged.

* Untersuch. u. d. Mollusken u. Anneliden des frischen Halls, p. 9, Taf. figs. 1 & 2 (Königsberg, 1889).

Signs of rapid division of the sperm-cells characterized many males in the middle of March, and towards the end of the month the perivisceral cavity formed a vast reservoir for the male elements. The body-walls were stretched, the muscular layers diminished, and the alimentary canal collapsed. The tubes of the segmental organ had also enlarged, so that sperms could readily find issue by the segmental papilla. Though the nuclei of the walls of the organ and its tubes were everywhere distinct, no trace of sperms was at any time found within it, so that they probably escape by rupture of the body-wall, as in allied forms.

The ova in the various examples throughout March appeared to attain full size and maturity, viz. about .1524 mm., and they were probably shed by rupture of the body-wall, the vast numbers set free, even from a limited area, affording an indication of the almost illimitable resources of nature in the sea. Whether the sexes discharge their elements *in situ* or by a terminal pelagic stage could not be ascertained. None were captured in the tow-nets dragged, by day and by night, up stream at ebb-tide, and no indication of any change in the structure of the feet, bristles, or eyes, and no shrivelling of the posterior region of the body as in the very interesting *Ceratocephalus Osawai* of Akira Izuka*, common in the estuary of the Sumida River in Tokyo, occurred. If one may hazard a conjecture, it is probable that the sperms and ova are discharged on the sites inhabited by the annelids, and the larvæ by-and-by carried seawards. There is no doubt, however, that, without change in the condition of the feet and bristles, the species is an apt swimmer, progressing through the water swiftly in graceful screw-coils.

Towards the end of May (29th) and for some time previously signs of degeneration appeared in certain ova, as if they were in process of absorption. These ova were smaller, minutely granular, and with larger oil-globules. The larger ova had lost the germinal vesicle and spot, and transmitted light more readily than formerly. Nothing was seen to suggest the view that certain ova were undergoing development, for, when kept in vessels both of sea-water and fresh water, they were rapidly disintegrated.

Some females at this date have shed all their ova, and are of a pale brownish-yellow colour, occasionally with a minute dusting of yellow grains along the dorsum.

Having failed to secure the early larvæ by any of the methods alluded to, masses of the clayey mud with the adults

* Journ. Coll. Sc. Univ. Tokyo, vol. xvii. art. ii. (1902).

in situ were brought from the banks of the Kinness Burn near the harbour towards the end of May, and a strict scrutiny made of the tubes and the mud lining them. Numerous postlarval forms were thus obtained, but no trace of trochophores or other early stages. Whether these stages had been passed in such an environment before the examination, or whether the later larvæ to be subsequently described had settled in the mud of the tubes after a pelagic stage is yet undetermined.

The youngest stage observed has three bristled segments (Pl. VIII. figs. 4 & 5), a head with two short palpi, and two short frontal tentacles. The eyes are imperfectly differentiated, consisting of an irregular group of black pigment-granules (fig. 5). A tentacular cirrus occurs on each side opposite the eyes. The three feet are nearly alike, each with a bristle-tuft and a small dorsal cirrus, or the first is rudimentary (fig. 4). A minute caudal cirrus is at each side of the posterior end. Between the last foot and the pygidium is a projection, indicating a segment. The proboscis has a pair of jaws each with three long teeth, including the anterior fang (Pl. VIII. fig. 6). The opaque part of the gut extends over the last two bristled segments. The minute bristles already present the typical structure of camerated shaft and homogomph articulation of the end of the shaft, and are in two bundles in each foot.

No younger form has yet been found amongst the mud or the adults, so that it is probable that they settle down at this stage. Moreover, no pelagic larvæ appeared in the vessels; yet as the postlarval forms with three bristled segments occurred in the mud of the tubes of the adult, it would appear that all do not wander.

When the postlarval form has four bristled segments the head has two eyes on each side, placed close together and posteriorly, a pair of short frontal tentacles, short palpi which present no distal articulation, a pair of tentacular cirri, and two short anal cirri. Behind the head, which bears the tentacular cirri, is a region with only bristles on each side; a foot with a large bristle-tuft and a minute dorsal cirrus follows, and then a second foot of similar structure. A rudimentary foot comes next, with a bristle-tuft on one side. A rudimentary ventral cirrus occurs on each foot. A pair of minute jaws having two teeth behind the anterior fang is found in the proboscis. Vast swarms of Infusoria (like monads) frequent the moist and odoriferous mud in which the young Nereids occur.

The postlarval form of the 28th May (Pl. VIII. fig. 7)

has a head with two comparatively large frontal tentacles and two stumpy palpi with very short terminal segments that only occasionally are visible, two pairs of tentacular cirri, the last with a spine in the dorsal, five pairs of distinctly bristled feet, with more evident dorsal and ventral cirri and slightly brownish spines, besides two rudimentary ones behind and a large pygidium with two caudal cirri. The cirrus of the first bristled segment is elongating, but the bristles are shorter than in the succeeding foot. The mouth is a wide aperture, followed by the somewhat ovoid proboscis, which is armed with two translucent jaws having three prominent teeth which are proportionately longer than in the adult. The proboscis is narrowed posteriorly and joins a large opaque, yellowish, glandular region, broad and truncated in front and diminishing posteriorly and terminating in the pale rectal part of the gut and its dorsal anus. The opaque glandular region stretches from the space between the second and third feet to the last bristled foot, and shows the groups of oily granules so characteristic of the glands on the walls of the alimentary canal. A pair of slightly opaque ovoid glandular bodies, the segmental organs, lie behind the first complete foot, just in front of the opaque region of the gut, and active ciliary action is occasionally noticed in them.

In the postlarval form with six bristled feet the eyes are better defined and the palpi, frontal tentacles, and tentacular cirri are larger. The dorsal cirrus of the first bristled segment is the longest in the animal, but there is no spine. The spines are darker, the posterior end remains bifid, and three teeth occur behind the anterior fang in each jaw.

When seven bristled feet are present the caudal cirri are considerably longer, the last foot (seventh) having a few short bristles, a short dorsal cirrus, two short spines, and a minute rudiment of a ventral cirrus. Behind is an indication of the eighth foot as a lateral projection, with a minute papilla representing the dorsal cirrus. Internally is the tip of a minute spine, but no bristles. The ventral of the first tentacular cirrus (opposite the eyes) is a short subulate process; that of the next segment is indistinct, though, with the exception of the caudal cirri, the dorsal is the longest of the series. The bristles of this segment are always short and in contrast with the next segment, which shows the segmental organs immediately behind. Opacities in the corresponding parts of the following feet indicate the early development of these organs throughout. Traces of a fourth tooth behind the great anterior fang of the maxillæ are visible. This description might also apply to a postlarval form with eight

bristled feet (Pl. VIII. fig. 8), the latest stage observed towards the end of May.

If the young Nereids of the foregoing stages are left in the vessels beside the adults the larger examples rapidly disappear. They are probably devoured by the adults, only the minute stages escaping capture, and in all likelihood they, too, would by-and-by be found out and captured; yet, as in the fishes, these checks have little influence on the permanent abundance of the species.

On the 17th July the young forms are found on the same sites, but considerable progress has been made in development. The head in outline nearly resembles that of the adult and is marked by whitish pigment in front of the eyes in the smaller, brownish in the older, which are definitely formed on each side, the anterior pair being somewhat larger and furnished with lenses. The frontal tentacles and the palpi are well formed and show numerous fine palpocils, the mobility of the distal segment of the palpi being noteworthy. The two pairs of tentacular cirri are now much longer, the dorsal stretching outward like fine hairs as the animal pushes its snout forward. They retain the proportions to each other of the adult, though they have not yet reached full development in any case. The ventral of each is considerably shorter than the dorsal, but projects clearly on each side, the first rather longer and thicker at the base than the frontal tentacles. The body is now elongated, having from sixteen to twenty bristled feet, and is marked along the centre by a yellowish or brownish streak, often slightly moniliform or zigzag from the intestinal contents, and a whitish dot is observed in some at the bases of the feet. The massive and somewhat ovoid proboscis has six teeth behind the great anterior fang, and the narrow part of the canal behind it is usually firmly contracted (and empty). The first part of the gut behind the post-proboscidian narrow region is the largest, and for some distance it is not marked by lateral constrictions, as in the succeeding portion. Most of the feet anteriorly present a condition approaching that of the adult, though the dorsal cirrus is shorter. Only the last two feet are devoid of bristles externally. The caudal cirri are now considerably longer. The circulation of the red blood in the dorsal and ventral trunks is now evident. The segmental organs extend backwards to the posterior feet, though not quite to the tail.

So far as observed at St. Andrews, therefore, there is no foundation for the statement that the Scotch representatives are hermaphrodite, and still less that they are viviparous, as

mentioned by Max Schultze, by the 'Cambridge Natural History,' and by Gravier. Max Schultze* gives a circumstantial account of finding female examples in April at Greifswald with ciliated eggs and pear-shaped larvæ in the body-cavity, and he figures two of the latter, hundreds of which occurred in the cavities at the bases of the feet. His figures, however, give rise to doubt as to the nature of the ciliated forms, which have the narrow end of the pear anteriorly with the two eyes at some distance behind it. In one, indeed, the mouth is indicated behind the eyes as a small radiated disk. The posterior end of the larva is broad and rounded. In the light of the condition at St. Andrews doubt arises as to correctness of the interpretation, more especially in view of the structure of the larva; but it is right to give a margin for possible variations in regard to internal fertilization under certain circumstances. Yet it seems unlikely.

The foregoing interpretation as to the mode of reproduction would seem to be most in accordance with observation, since on the 28th May masses of clayey mud brought from the habitat of the species and with the annelids *in situ* showed many free ova amongst the mud coating the walls of the tube, and, further, of various postlarval examples.

EXPLANATION OF THE PLATES.

PLATE VI.†

- Fig. 1.* Ventral view of the head of a porbeagle shark, 9 feet long, showing the rounded tip of the hyoidean apparatus (*a*) projecting from its smoothly finished aperture.
Fig. 2. Aspect of the same region from the interior of the mouth.
Fig. 3. Lateral view of the preparation, indicating the projection of the hyoidean boss.

N.B.—The first figure is drawn to a larger scale than figs. 2 and 3, which are nearly equally reduced.

PLATE VII.

- Fig. 1.* Third right arm of the large *Ommastrephes sagittatus*, d'Orb., showing the keel to the left, the web with its supporting rays, and the suckers. A portion of the web has been removed. Slightly reduced.

* 'Entwicklung von *Arenicola piscatorum* nebst Bemerk. über Entwicklung. and. Kiemenw. 1856, p. 214, Taf. ix. figs. 11 & 12.

† I am indebted to the Carnegie Trust for these figures, those of Pl. VII., and four of Pl. VIII.

Fig. 2. Inner face of the same arm with four suckers. Slightly enlarged.

Fig. 3. Horny rim of a sucker, showing the arrangement of the sharp teeth, usually on the distal margin of the rim. Enlarged.

PLATE VIII.

Fig. 1. Masses of perivisceral corpuscles near the bases of the feet of *Nereis diversicolor*, O. F. M., 7th December, 1906. \times Zeiss oc. 2, obj. F.

Fig. 2. Male elements. Similarly magnified.

Fig. 3. Large corpuscles floating freely in the coelomic space, 21st January, 1907. \times Zeiss oc. 2, obj. F.

Fig. 4. Postlarval form of 28th May, 1907, with three bristle-tufts (one rudimentary).

Fig. 5. Another of same date with three bristle-bundles.

Fig. 6. Mandible of the foregoing. \times Zeiss oc. 2, obj. D.

Fig. 7. Postlarval form of 28th May with five bristle-bundles. Magnified.

Fig. 8. Postlarval form of 28th May with eight bristle-bundles. Magnified.

XXVIII.—*Descriptions of apparently new Species and Subspecies of Mammals belonging to the Families Lemuridæ, Cebidæ, Callitrichidæ, and Cercopithecidæ in the Collection of the Natural History Museum.* By D. G. ELLIOT, D.Sc., F.R.S.E., &c.

HAVING for some time been engaged in the study of the Primates, it was found necessary to investigate the material contained in the various great museums in the Old World, and, beginning with the vast collection of the Primates contained in the Natural History Museum, London, my friend Mr. Oldfield Thomas, Curator of Mammalogy in that institution, not only most kindly gave me every facility for pursuing my studies, but also requested that I would describe any specimen that I found in the collection that I considered might be new. In various genera the Museum is very rich both in number of species and examples, and the advantage one possessed in working with such splendid material is exemplified in the comparatively large number of new forms contained in this paper. My thanks, therefore, are especially due to Mr. Thomas for the opportunity, not only of examining the great collection under his care, but of making known to mammalogists the various forms that seemed worthy of special recognition.

Family Lemuridæ.

Genus GALAGO.

Galago zuluensis, sp. n.

Type locality. Zululand, East Africa.

Gen. char. Similar to *G. Hindei*, but browner and with much larger ears; tail darker and shorter. Skull one third larger than that of *G. Hindei*, teeth larger.

Colour. Head and upperparts broccoli-brown and grey mixed, darkest on the head; outer side of limbs wood-brown; dorsal line washed with Mars brown; underparts and inner side of limbs yellowish white; hands and feet greyish brown; tail above pale Mars brown, beneath paler; ears black.

Measurements. Total length about 570 mm.; tail 320; ears 31 (skin). Skull: occipito-nasal length 70; hensel 57; zygomatic width 46; intertemporal width 19; palatal length 28; breadth of brain-case 33; length of nasals 19; length of upper molar series 29; length of mandible 46; length of lower molar series 23.

B.M. no. of type 94. 6. 29. 1.

This animal is of about the same size in head and body-length as *G. Hindei*, but has a considerably shorter and much darker tail. When the two are placed side by side *G. Hindei* appears like a grey animal in comparison. The ears of the present form are about one third larger both in length and width. In their dried and shrunken state they measure 31 mm. in length and 27 mm. wide, while those of *G. Hindei* are 24 mm. by 22 mm. respectively. There is such a vast difference in the size of the skulls and teeth that they hardly admit of comparison. In colour *G. zuluensis* is much like *G. crassicaudatus*, but has a much smaller skull, it being midway between *G. crassicaudatus* and *G. Hindei*, with all the differences such a disparity of size would create.

Galago Hindei, sp. n.

Type locality. Kitui, Athi River, British East Africa. Altitude 3500 feet.

Gen. char. Size large, colour pale; ear small; tail very long. Smaller in total length than either *G. crassicaudatus* or *G. Garnetti*.

Colour. Head and upperparts pale wood-brown, washed on head and dorsal region with darker brown; arms and hands like head; outer side of legs isabella-colour; feet dark

brown; chin vinaceous cinnamon; rest of underparts white; tail above pale wood-brown, beneath whitish.

Measurements. Total length about 575 mm.; tail 370; hind foot 86; ear 39. Skull: occipito-nasal length 63; hensel 49; zygomatic width 42; intertemporal width 20; palatal length 23; breadth of brain-case 29; length of nasals 19; length of upper molar series 19; length of mandible 41; length of lower molar series 20.

B.M. no. of type 1. 5. 6. 2.

The skull of this form is considerably smaller than that of either *G. crassicaudatus* or *G. Garnetti*. In colour it differs in being paler and in the very long, pale, almost white tail. Two specimens are in the Museum collection varying slightly in colour, the paratype having unfortunately lost half its tail.

Galago gabonensis Batesi, subsp. n.

Type locality. Como River, Gaboon, West Africa.

Gen. char. Similar to *G. gabonensis*, but much darker above and has a black tail and light grey feet, and from *G. Alleni* it is distinguished by its black tail and grey feet and legs below the knee.

Colour. Forehead, base of ears, cheeks, stripe between eyes, and nose light grey; top of head and hind-neck and upperparts dark mummy-brown; outer side of arms dark tawny; a patch of tawny on thigh, the upper portion darker than the lower; rest of legs brownish grey, becoming clear grey on feet; throat and front of neck yellowish, rest of lower parts whitish; hands greyish mummy-brown; tail seal-brown, sprinkled with grey on basal half. Ears large, blackish.

Measurements. Total length 470 mm.; tail 250. Skull: occipito-nasal length 48; hensel 38; zygomatic width 32; intertemporal width 18; palatal length 19; width of brain-case 24; length of nasals 13; length of upper molar series 16; length of mandible 31; length of lower molar series 14.

B.M. no. of type 96. 10. 9. 4.

While this race has a general resemblance to both *G. Alleni* and *G. gabonensis*, it can readily be distinguished from both: by its grey legs and feet from *G. Alleni*, and from *G. gabonensis* by its grey feet, darker upperparts, and black tail. The two forms come together on the Como River, but there are no intermediate specimens.

Galago braccatus, sp. n.

Type locality. Mount Kilimanjaro, East Africa.

Gen. char. Similar to *G. gallarum*, but darker grey above,

and the bright buff of the limbs ends abruptly on meeting the grey colour, and does not grade into it as in the allied species.

Colour. Head and neck buff, the hairs tipped with black, giving to these parts a grizzled appearance; rest of upper-parts iron-grey; orbital ring black; stripe between eyes, nose, upper lip, neck, and chin grey; outer side of arms and legs buff; hands and feet yellowish grey; inner side of thighs and underparts yellowish white; tail dark Prout's brown, hairs tipped with white; ears large, naked, black.

Measurements. Total length about 480 mm.; tail 300 (skin). Skull: occipito-nasal length 45; hensel 32; zygomatic width 29; intertemporal width 19; palatal length 15; width of brain-case 24; length of nasals 12; length of upper molar series 13; length of mandible 26; length of lower molar series 13.

B.M. no. of type 2. 11. 5. 1.

This rather handsome species was obtained by Mr. A. B. Percival on Mount Kilimanjaro, East Africa. While allied to *G. gallarum*, Thomas, it is easily distinguished from that species by its dark grey colour and the abruptness with which the buff and grey come together on the legs. As is to be expected of an animal dwelling at a high altitude, the fur is thick and long. There are no perceptible differences in the skulls.

Galago nyasæ, sp. n.

Type locality. Mountains south of Lake Nyasa, Central Africa.

Gen. char. Fur woolly; tail bushy; skull, though much broken, exhibits great differences from that of *G. sennar-ensis*, ranging from the White Nile south to Ankola west of the Victoria Nyanza. The rostrum is long and more slender, the nasals long and narrow; the palate is long and narrow, and not so wide posteriorly as in the skulls of *G. sennar-ensis*; the anterior line of the orbit is in front of m^1 instead of in front of pm^1 , as seen in the other; there is only a slight rise of the frontal above the rostrum, thus causing the superior outline of the skull to be flatter.

Colour. General hue above broccoli-brown; outer side of arms broccoli-brown; legs cream-buff; chest cream-buff; underparts and inner side of limbs yellowish white.

Measurements. Total length about 355 mm.; tail 185 (skin). Skull: from frontal suture to end of nasals 27; length of nasals, median line, 10; width of rostrum at canines 7; length of palate 15; width between last molars 7; length of

upper molar series 13; length of mandible 24; length of lower molar series 13.

The type and an example in alcohol from Zomba, Nyasaland, are the only representatives of this species in the collection.

B.M. no. of type 64. 12. 10. 15.

While perhaps this species resembles *G. gallarum* in colour more than any other, the skull, in its long and narrow rostrum and low crown, is very different. The type was procured by Dr. Kirk, when he was accompanying Dr. Livingstone, the famous African explorer.

Subgenus HEMIGALAGO.

Galugo Thomasi, sp. n.

Type locality. Fort Benin, Semliki River, Central Africa.

Gen. char. Larger than *G. Demidoffi*; colour quite different. Skull much larger; differently shaped brain-case, much broader in occipital region and higher over roots of zygomatic; teeth much larger.

Colour. Head and upperparts drab, washed with Mars brown on head and dorsal region; stripe between eyes and nose yellowish white; outer side of limbs drab; underparts and inner side of limbs buff; tail Mars brown.

Measurements. Total length 347 mm.; tail 210; hind foot 58; ear 28. Skull: occipito-nasal length 40; hensel 28; zygomatic width 25; intertemporal width 16; palatal length 14; breadth of brain-case 21; length of nasals 12; length of upper molar series 11; length of mandible 22; length of lower molar series 11.

B.M. no. of type 6. 12. 4. 58.

This, the fourth member of the subgenus *Hemigalago*, differs from all the others in colour and dimensions, being the largest of all, and cannot well be compared with or mistaken for any of them. The skull shows many and great differences from those of the other species. The type was procured on the boundary-line of Uganda and the Congo Free State, and a second and somewhat darker specimen at Dumo, Uganda. Whether it penetrates farther into the Congo Region or is confined to Uganda is unknown.

Family Cebidæ.

Genus AOTUS.

Aotus boliviensis, sp. n.

Type locality. Province of Sara, Central Bolivia.

Gen. char. Similar in colour to *A. Azaræ*, but cranial

characters quite different. Orbits wider and higher; orbital portion of frontal bulging outward, forming a decided curve from the frontal to the nasals; nasals longer and wider; brain-case longer and narrower posteriorly; extreme width across orbits much greater; superior outline of skull much less curved; angle of occipital region much less; teeth larger, particularly the last upper molar; space from posterior edge of foramen magnum to interparietal much greater; basioccipital between bullæ much wider.

Colour. Similar to *A. Azaræ*, but more tinged with red on upperparts; a white spot near each eye extending back upon the head; a broad black line on middle of forehead from nose to between ears and a narrow black line from corner of eye on each side of the head bordering the white spot; upperparts mixed iron-grey and russet, becoming more brownish on lower back; cheeks and chin white; sides yellowish brown; inner side of limbs and underparts pale orange-ochraceous; hands and feet dark greyish brown; tail mixed ochraceous rufous and black on basal half, remainder black. The hairs of tail are all ochraceous rufous at base, and this shows more or less throughout the entire length.

Measurements. Total length 720 mm.; tail 400; hind foot 100; ear 35. Skull: total length 64; occipito-nasal length 61.5; hensel 44; zygomatic width 40.5; intertemporal width 33; extreme width of orbits 45; height of orbits 21; length of nasals 12; width of brain-case 35; distance from foramen magnum to interparietal 11; width of basioccipital between bullæ anteriorly 3.5; length of upper molar series 14; length of mandible 41; length of lower molar series 16.

B.M. no. of type 7. 8. 2. 9.

While similar in colour to *A. Azaræ*, the present species differs greatly in its cranial characters. The skull is much larger and the brain-case considerably longer, while the orbits are enormous, very large even for these big-eyed animals. Two specimens (a male and female) were obtained by Mr. J. Steinbach in the Province of Sara, Central Bolivia.

Genus SAIMIRI.

Saimiri macrodon, sp. n.

Type locality. Copataza River, Ecuador.

Gen. char. Similar to *S. sciurea*, but hands and feet much darker. Skull has a much higher and narrower brain-case, much wider palate, larger teeth, with the external line of the

upper tooth-row much more curved; zygomatic arch wider and intertemporal width greater; bullæ narrower and longer.

Geogr. distr. Upper waters of the Amazon in Ecuador, and Peru.

Colour. General colour like *S. sciurea*, with the back darker, that of the type being tawny and black on the dorsal region; golden yellow and black on the flanks; arms above elbows dark grey washed with yellow; legs paler; underparts yellowish white; the forearms, hands, and feet tawny; head and tail like *S. sciurea*.

Measurements. Size similar to *S. sciurea*. Skull: occipito-nasal length 64.5 mm.; zygomatic width 43; intertemporal width 32; length of nasals 11; width of brain-case 36; height of brain-case above zygomata 35; palatal length 19; length of upper molar series 16; width of palate between canines 12; width of palate between last molars 13.

B.M. no. of type 80. 5. 6. 15.

While the general colour of this animal resembles that of *S. sciurea* from the east coast of South America, it is at once noticeable by its much darker forearms, hands, and feet. The greatest differences, however, between the two forms are exhibited in the skulls and in the large teeth of the present species. The brain-case has quite a different shape, being long and narrow, with an elevated forehead sloping rapidly downward to the occiput, which is narrow and rounded. The palate is wider throughout its length; the teeth much larger, the canines longer and stouter. Several examples were obtained in the type locality and others from the Jurua River, a tributary of the Amazon, and from Marcapata, Peru.

Genus CALLICEBUS.

Callicebus ustofuscus, sp. n.

Type locality. "Brazil."

Gen. char. Allied to *C. cupreus*, but much darker in colour; teeth much larger; palate longer and narrower; brain-case wider; space between pterygoid processes and bullæ and the width of basioccipital throughout its length greater. Practically the skull is larger in every way and more massive. Mandible longer and heavier, and the depth of the ramus greater.

Colour. General hue above burnt-umber, the hairs being slaty-grey at base, then annulated with two bands of slate and two of clay-colour, and a dark tip. Face naked, black; top of head a mixed dark ochraceous rufous and black, the

black predominating on the forehead; the rump is redder than the back and is a burnt-sienna on the outer side of the limbs; hands and feet claret-brown; sides of head, throat, inner side of limbs, and underparts maroon; basal third of tail black, the hairs being chestnut with broad black tips, rest of tail mixed black and yellowish grey or very pale clay-colour, the underside of tail being almost altogether clay-colour; ears black.

Measurements. Size about the same as *C. cupreus*. Skull: occipital region has been cut away; intertemporal width 32 mm.; zygomatic width 41; palatal length 21; width between last molars 12; breadth of brain-case 35; length of nasals 9; length of upper molar series 14; length of m^1 5; length of mandible 42; extreme height of mandible 35; length of lower molar series 17.5.

B.M. no. of type 51. 7. 3. 1.

This species is nearest *C. cupreus*, but is altogether different in colour and darker in all its hues. The skulls also are not at all in accord, the differences mentioned being very conspicuous when they are compared. The unique example has no history beyond the statement that it came from Brazil.

Callicebus subrufus, sp. n.

Type locality. Pachitea, Ucayali River, Peru. Altitude 400 to 500 feet.

Gen. char. Allied to *C. leucometopa*, but colour entirely different.

Colour. Face black; a narrow black bar on forehead above eyes, succeeded by a broader one of white; rest of head on top, neck, and entire upperparts bright russet, becoming darker and more reddish on the rump, the hairs being slate at base, then alternately ringed with slate and bright russet, or on the rump with slate and dark russet or reddish; arms to elbows and thighs to knees grey, the hairs being seal-brown at base, then russet, and tips grey, this colour overlying the rest; hands and feet and rest of limbs bright chestnut-red; sides of face, whiskers, inner side of limbs, throat, chest, and middle of abdomen bright chestnut-red; fingers and toes yellowish grey; tail, basal third black, with chestnut hairs mixed with black at the root, remainder light grey above, whitish beneath; hair on ears white.

Measurements. Size about equal to that of *C. leucometopa*. Skull: occipito-nasal length 51 mm.; hensel 40; zygomatic width 35; intertemporal width 29; palatal length 18; breadth of brain-case 33; nasals broken; length of upper

molar series 16; length of mandible 35; length of lower molar series 16.

B.M. no. of type 4. 7. 7. 2.

While allied to *C. leucometopa*, the great difference in colour the present species exhibits makes it easily recognizable. In its yellowish-grey fingers and toes it shows a leaning towards *C. ornatus*, but in other respects it has no resemblance to that species.

Genus LAGOTHRIX.

Lagothrix lugens, sp. n.

Type locality. Mountains 2° 20' north of Tolima, Colombia. Altitude 5000 to 7000 feet.

Gen. char. Body stout, heavy, as in *L. lagotricha*, but colour very different; fur thick, woolly; limbs moderately long; tail very long and very broad at base.

Colour.—Male. Head, arms, and body dark purplish brown, almost black; legs and tail blackish brown washed with grey, the hairs being blackish brown at base, then black and tipped with grey or yellowish; breast reddish chestnut, rest of underparts black.

Measurements. Size same as *L. lagotricha*. Skull: total length 112 mm.; occiput broken; occipito-nasal length 105; zygomatic width 74; intertemporal width 45; palatal length 34; breadth of brain-case 57; length of brain-case from end of nasals 79; length of nasals 13; width of nasals anteriorly 13; length of upper molar series 24; length of mandible 74; length of lower molar series 30.5.

B.M. no. of type 90. 2. 22. 2.

Two specimens are in the collection which differ so markedly from all other members of the genus that it is impossible to assign them to any described species. The fur is soft and very thick, particularly so at the base of the tail. One is dark purplish brown or blackish on the upperparts to rump, and blackish to grey on legs and tail; the other is darker. The skulls resemble, as may be expected, those of *L. lagotricha* and *L. infumatus* in general, but the nasals have a depression in the middle and the anterior portion stands at a right angle to the posterior and are very broad anteriorly; the brain-case is shorter than in the skulls of the other species and the narial opening is of a different shape, like a heart but not so pointed, more rounded on the lower side.

Family *Cercopithecidae*.Genus *PAPIO*.*Papio strepitus*, sp. n.

Type locality. Fort Johnston, Nyasaland, S.E. Africa.

Gen. char. Size large, exceeding the dimensions of *P. pruinus*; hair very long, loose; face partly naked; brain-case about two thirds the length of the facial region; nasals only slightly raised above rostrum, wide anteriorly; pit in side of lower jaw long and deep; palate narrow and of nearly equal width throughout its entire length; tooth-rows straight.

Colour. Forehead mixed pale yellow and black; crown and nape dull tawny ochraceous, centre of crown darker, the hairs ringed with dull tawny ochraceous and black, those on side Prout's brown at base, rest tawny ochraceous. The appearance of the crown and nape is more reddish than yellow, with a dark central portion; sides of head below ears buff; lower part of neck to middle of back purplish drab and ochraceous buff; base of hairs purplish drab, the rest ringed with black and ochraceous buff, some hairs tawny ochraceous tipped with black. The purplish drab of the base of hairs dominates the other colours and gives a kind of dark patch to this part of the back. On the shoulder is a patch of hairs, buff at their roots, graduating to cream-buff at their tips, not ringed; lower part of back paler than the upper, more yellow showing, and over all the upperparts are numerous long hairs with whitish tips; flanks ochraceous buff; upper part of arms, entire legs, and feet ochraceous buff; forearms and hands mixed ochraceous buff and black, the latter being the colour of the base of the hairs showing through; underparts yellowish grey; tail at base like back, mixed black and ochraceous, tip ochraceous buff; cheeks and sides of nose and the lips covered with short yellowish hairs; upper eyelids flesh-colour, space beneath the eyes and the nose black.

Measurements. Head and body 915 mm.; tail 609 (skin). Skull: total length 195; occipito-nasal length 160; hensen 139; intertemporal width 58; zygomatic width 115; palatal length 86; breadth of brain-case 79; length of nasals 72; anterior width of nasals 14; length of upper molar series 45; length of mandible 115; length of lower molar series 60.

B.M. no. of type 97. 10. 1. 9.

The general appearance of this species is that of a yellowish animal, with a brownish back and a reddish head and limbs, and underparts whitish grey. This is the effect the various colours of the hairs produce when glanced at. In coloration it belongs to the light-hued baboons, of which section *P. babuin* may be considered a representative. Looked at in certain lights the hairs have a greenish-yellow tint, but when carefully examined the colours are as given in the description and unlike any of the other species. Two specimens were obtained by Sir H. H. Johnston in Nyasaland, the type at Fort Johnston and the other at Zomba on Lake Nyasa. The species bears no resemblance whatever to *P. pruinus*, Thomas, also procured at Fort Johnston, either in colour or in the characters of the skull.

Genus COLOBUS.

Colobus tephrosceles, sp. n.

Type locality. Ruahara River, Toro, altitude 4000 feet, Central Africa.

Gen. char. Similar to *C. rufomitatus*, but differs in not having any black on the head between tufts, in the pale coloured arms and legs, in the grey-brown basal portion of the tail, in the absence of black stripe between ears and shoulders, and in the feet and hands being brownish black instead of dark olive-brown. Upright tufts on sides of crown above ears.

Colour. A narrow black band on forehead extending backwards to ears; top of head and nape dark rusty brown; upright tufts dark rusty brown, mixed with some brownish-black hairs tipped with yellow, these showing chiefly on the outer side of the tufts; sides of head between ears and eyes blackish grey, the hairs hiding the ears; side of lip purplish grey, this extending over the lower jaw; hairs on upper part of back long, covering the shoulders, brownish black, grading into dark Prout's brown on sides and rump; outer side of arms pale greyish brown; outer side of legs pale brownish grey, lighter than the arms; underparts and inner side of limbs greyish white; hands brownish black; feet Vandyke brown; tail, basal third greyish brown, remainder blackish brown, grading into black at tip.

Measurements. No skull to type specimen. Another skull without skin, procured by Sir H. H. Johnston in Toro, has total length 116 mm.; occipito-nasal length 95; hensel 84; zygomatic width 78; intertemporal width 44; palatal

length 45; length of nasals 16; length of upper molar series 29; length of mandible 81; length of lower molar series 35.

B.M. no. of type 1. 8. 9. 129.

Three examples of this remarkable monkey were procured by Sir H. H. Johnston (one adult and two young) on the east side of Mount Ruwenzori at an altitude of 4000 feet. It is evidently closely allied to *C. rufomitratu*s from the coast, but exhibits quite sufficient differences in colour and markings to entitle it to a distinctive rank. As the species was not seen by the members of the Ruwenzori Expedition, lately returned to England, it must be considered as rare even in its own district.

XXIX.—*On Mammals from Northern Persia, presented to the National Museum by Col. A. C. Bailward.* By OLDFIELD THOMAS, F.R.S.

IN 1905 Col. A. C. Bailward made a shooting-trip across Persia, taking with him Mr. R. B. Woosnam to pay special attention to the collecting of natural history specimens, and he then obtained the series of mammals of which I gave an account during the succeeding winter*.

During the present year Col. Bailward has again been to Persia, taking Mr. Woosnam with him, but this time to the northern part of the country, between Teheran and the Caspian, and there Mr. Woosnam has collected the specimens enumerated below. Few in number as they are, for the trip was quite a short one, they include no less than five new forms, while all of them are most valuable accessions to the Museum, which had previously possessed almost nothing from that region. We thus have reason to be most grateful to Col. Bailward for taking advantage of his trip to increase our National Collections in a region as yet so poorly represented in the Museum; and the marked success of the present expedition should encourage him and others to repeat the experiment.

1. *Pipistrellus Kuhli*, Natt.

♂. 120. Teheran, Persia. 4600'.

A pale form, probably representing *P. lepidus*, Bly.

* P. Z. S. 1905, ii. p. 519.

2. *Pipistrellus pipistrellus*, Schr.

♂. 118. South coast of Caspian. 150'.

3. *Pterygistes noctula*, Schr.

♂. 134, 135. Resht, S. coast of Caspian.

4. *Myotis myotis*, Bechst.

♂. 132; ♀. 131. Elburz Mts., near Resht. 400'.

5. *Miniopterus Schreibersi pallidus*, subsp. n.♀. 113. South coast of Caspian. Alt. —25 m. 25th March, 1907. B.M. no. 7. 7. 14. 7. *Type*.

Similar to typical *M. Schreibersi* in all essential respects, but the general colour is paler, approximating to Ridgway's "wood-brown," while *Schreibersi* is rather darker than "broccoli-brown." Below, the colour, smoky grey in *Schreibersi*, is more or less suffused with buffy, especially in the inguinal region and along the proximal edge of the interfemoral.

Dimensions of the type (the starred measurements taken in the flesh):—

Forearm 46.5 mm.

*Head and body 55; *tail 57; *ear 12.

Skull: condylo-basal length 15; basisinual length 12; mastoid breadth 9.

All the European *Miniopteri* in the Museum collection are quite similar in colour and equally different from this pale Caspian example.

6. *Crocidura russula caspica*, subsp. n.

♂. 106. South coast of Caspian Sea. Alt. —25 m. 16th March, 1907. B.M. no. 7. 7. 14. 8. *Type*.

Like *C. russula monacha*, Thos.†, but larger, with shorter tail and darker belly.

Size markedly larger than in *monacha*. General colour above of exactly the same smoky brown as in that animal, but below it is even darker, being, in fact, of a brown very little lighter than the upper side. Tail of normal *russula* proportions, therefore much shorter than in *monacha*.

Skull large, stouter and heavier than in true *russula*, therefore much larger than in *monacha*, whose skull little exceeds

† From the neighbourhood of Trebizond. Ann. & Mag. Nat. Hist. (7) xvii. p. 417 (1906).

that of *C. mimula*, Mill. Brain-case of the narrow high type characteristic of *C. russula*.

Dimensions of the type (measured in flesh):—

Head and body 77 mm.; tail 38*; hind foot 14; ear 9.

Skull: condylo-basal length 21; basal length 19; greatest breadth 9·6; height of brain-case from basion 5·4; length of upper tooth-series 9·4.

Hab. and *type* as above.

This Eastern representative of the common *C. russula* is readily distinguishable from any of the described forms of that species by its dark colour, and especially its very dark under surface, which is scarcely lighter than the upper side.

7. *Crocidura leucodon persica*, sp. n.

♂. 127; ♀. 128. Elburz Mts., near Demavend. Alt. 6500'. 2nd May, 1907. B.M. no. 7. 7. 14. 9. *Type*.

"Trapped near a stream in oak-forest."—*R. B. W.*

Quite like true German *C. leucodon* in size, proportions, and skull, but the fur is shorter (hairs of back about 3·5 mm.) and the colour of the adult is much paler, that of the type being somewhat paler than Ridgway's "drab." The distribution and sharp definition of the upper and lower colours quite as in *leucodon*.

Skull with the characteristic flattened shape of the brain-case found in true *C. leucodon*.

Dimensions of the type (measured in the flesh):—

Head and body 72 mm.; tail 35; hind foot 12; ear 8.

Skull: condylo-basal length 19; basal length 17; greatest breadth 9·2; height of brain-case from basion 4·6; length of upper tooth-series 9.

Hab. and *type* as above.

This pretty little shrew is readily distinguishable from the European *C. leucodon* by its paler and more drabby colour. From *C. Guldenstaedti*, Pall., it is at once separable by its much shorter tail, as that species, with a trunk-measurement of 72 mm., has a tail 47 mm. in length.

Thanks to the kindness of Dr. Camerano and Dr. Festa, of the Turin Museum, I have been allowed the loan of the typical specimens of de Filippi's *Crocidura fumigata*†, and find that that animal is also a longer-tailed form, the spirit-specimen measuring 60 mm. for the head and body and 42 mm. for the tail. All traces of the original colour have

* Measured on skin. Mr. Woosnam writes 46, which is probably a *lapsus calami* for 36.

† Viaggio in Persia, p. 343 (1865).

unfortunately long vanished from the specimens, but the proportions and skull readily show that it is a different shrew from that now described.

The Trebizond form which I described as *C. leucodon lasius** differs still more from normal European *C. leucodon* both in size and length of tail, and I am now disposed to think it should be recognized as an independent species, whose name would therefore be *Crociodura lasia*.

8. *Mus rattus*, L.

♀. 102, 108, 109. South coast of Caspian. 0'.

9. *Mus musculus*, L.

♂. 100, 101, 104, 133. South coast of Caspian. 0'.

♂. 125, 126. Elburz Mts., near Demavend. 6500'.

10. *Micromys sylvaticus*, L.

♂. 103, 105, 107, 117; ♀. 114, 115, 116. South coast of Caspian. 0'.

♂. 129, 130; ♀. 124. Elburz Mts., near Demavend. 6500'.

11. *Nesokia Baihwardi*, sp. n.

a. ♀. 351. Bunder-i-gaz, S. shore of Caspian. Alt. —25 m. 25th March, 1907. B.M. no. 7. 7. 14. 30. *Type*.

A member of the *N. Huttoni* group.

External characters as usual, the general colour of the type wood-brown above, rather paler below.

Skull larger and heavier than that of *N. Huttoni*. Superior outline strongly bowed. Nasals short, not broadened in front, evenly but slightly narrowing backwards to the more or less rounded posterior end. Supraorbital ridges very thick and heavy at the postorbital point, abruptly dying away halfway across the parietals. Interparietal fairly large. Bullæ as in *N. Huttoni*. Molars rather small in proportion to the size of the skull.

Dimensions of the type (measured on the spirit-specimen before skinning):—

Head and body 167 mm.; tail 123; hind foot 33; ear 24.

Skull: condylo-basal length 42; basilar length 37; zygomatic breadth 27; nasals, length 12 2, breadth anteriorly 3·9,

* Ann. & Mag. Nat. Hist. (7) xvii. p. 416 (1906).

mesially 3·7; interorbital breadth 6·1; tip to tip of post-orbital processes 10·7; interparietal 4×8 ; palatilar length 23; diastema 14; palatal foramina 5; length of upper molar series (crowns) 6·5, (alveoli) 8·5.

Hab. and *type* as above. The specimen not old, the molars being little worn down and the basilar suture not quite closed.

This *Nesokia* is probably the form referred to *N. Huttoni* by Radde and Walter* in their paper on the mammals of Transcaspia, while they described as new a species ("*N. Boettgeri*") which appears to me to be really assignable to the true *N. Huttoni*, as also, I think, is probably the case with Nehring's "*N. Huttoni* var. *Satunini*"† from Merv. The majority of the measurements of the skull given by Radde and Walter for *N. Boettgeri* might actually have been taken from the typical skull of *N. Huttoni* now in the British Museum (no. 79. 11. 21. 499), while a topotype of *N. H. Satunini* is also quite similar.

N. Bailwardi mainly differs from *N. Huttoni* by its larger size, more bowed skull, and the heavier supraorbital ridges, these characters being the more noteworthy as the typical skull is distinctly younger than that of the Kandahar species. A close ally is described in the succeeding paper.

12. *Microtus terrestris persicus*, de Fil.

♂. 110. S. coast of Caspian Sea. Alt. 0'.

"Trapped on banks of a stream."—R. B. W.

As with the type of *Crociodura fumigata*, I have been most kindly allowed the loan of de Filippi's examples of his "*Arvicola amphibius* var. *persicus*" by the authorities of the Turin Museum.

To that form two voles from Van, obtained in 1896 by Major W. H. Williams, were referred by Barrett-Hamilton‡, and the interest in examining the type was to see if it presented the peculiar rounded character of the molars, to be described further on, which was present in these Van examples.

De Filippi's specimens consist of a stuffed specimen and an imperfect skull; but as it was possible that the two individuals might differ in the character of their teeth, I have been permitted to extract the skull of the stuffed specimen, which must be regarded as the main type, since the external

* Zool. Jahrb. Syst. iv. p. 1036 (1889).

† SB. Ges. nat. Fr. Berl. 1899, p. 108.

‡ Ann. & Mag. Nat. Hist. (7) iii. p. 224 (1899).

characters were alone used by de Filippi to distinguish his variety.

The skull so extracted proves fortunately to be perfect, and is therefore a great improvement on the broken skull on which he based his statement that the osteological characters of the Persian vole were absolutely the same as those of *Arvicola amphibius*. But the statement itself needs practically no modification, for this typical skull has no special peculiarities, and in particular has the normal angular molars found in European water-voles in general. It therefore precisely agrees with Mr. Woosnam's specimen no. 110 from the low-lying shores of the Caspian Sea, a region through which de Filippi also passed; and I am disposed to believe, therefore, that though that author first saw animals of this group at Sultanieh, which is on the plateau south of the Elburz, the actual specimen he brought home and described was from the lower and more northern region. Moreover, in speaking of them at Sultanieh, he says they were abundant then and onwards to the end of his time in Persia, a statement that covers the Caspian as well as the Elburz region. Actual Sultanieh specimens may hereafter upset this conclusion; but in any case I feel compelled to distinguish the round-toothed forms as a different subspecies, to which all the specimens as yet certainly known to come from the plateau belong.

13. *Microtus terrestris armenius*, subsp. n.

♂. 123. Elburz Mts., near Demavend. Alt. 9000'.

[♂. 16, 17. Van, Armenia. Alt. 5000'. Presented by Major W. H. Williams, R.A.]

"Shot in a small stream."—*R. B. W.*

"Dug out of hole by stream."—*W. H. W.*

External characters quite as in *M. t. persicus*, except that the general tone is slightly greyer and the ears are rather shorter.

Skull essentially as in that animal, though the brain-case is, perhaps, a little longer in proportion to its breadth and the nasals incline to be more expanded anteriorly.

Molars with quite the same pattern as in the lowland form, but all the enamel-bound spaces, instead of being sharply angular externally and internally, are rounded, often almost circular, so that there are no real angles, external or internal, either above or below, the teeth having therefore a very peculiar and characteristic appearance, quite unlike that found in normal water-voles.

Dimensions of the type (taken in flesh) :—

Head and body 195 mm.; tail 126; hind foot 29; ear 16.

Skull: condylo-basal length 41·5; basilar length 37·2; greatest breadth 25; nasals 11·2 × 5·6; interorbital constriction 4·8; palatal foramina 7; length of upper molar series (crowns) 9·6, (alveoli) 10·1.

External dimensions of Mr. Woosnam's specimen (measured in flesh) :—

Head and body 174 mm.; tail 136; hind foot 33; ear 16.

Hab. Armenia and N.W. Persia, on plateau. Type from Van, 5000'.

Type. Adult male. B.M. no. 97. 6. 4. 10. Original number 17. Collected 23rd December, 1896, and presented by Major W. H. Williams, R.A.

I can find no evidence that the peculiar rounded character of the molar spaces, as contrasted with their normal angular condition in the type of *persicus* and the Caspian Sea specimen no. 110, is due either to sex, age, or individual variation, and it therefore seems advisable to give a special name to the specimens that show it in spite of their resemblance to the lowland examples in other respects.

14. *Microtus* sp.

♂. 121. Elburz Mts., near Demavend. 4000'.

A small species of the *M. arvalis* group.

15. *Cervus elaphus*, L.

Young ♀. 122. Elburz Mts., near Demavend. 5000'.

XXX.—*A Subdivision of the Old Genus Nesokia, with Descriptions of Three new Members of the Group, and of a Mus from the Andamans.* By OLDFIELD THOMAS.

THE genus *Nesokia* contains three such very distinct and natural groups that in accordance with modern ideas they should be recognized as distinct genera. Their respective characters have already been described by Anderson, Blanford, and myself, but the most tangible may be briefly recapitulated as follows :—

I. NESOKIA, Gray, Ann. & Mag. N. H. x. p. 264 (1842).

Type. *Arvicola indica* *, Gray & Hardwicke. (*Nesokia Hardwickei* auctorum.)

Skull short and broad. Palatal foramina short. Molars laminate, least *Mus*-like.

Mammæ 2—2=8.

II. GUNOMYS †, gen. nov.

Type. *Arvicola bengalensis*, Gray & Hardwicke. (*Nesokia bengalensis* auct.)

Skull broad. Palatal foramina long.

Mammæ irregular, 14—18 in number.

III. BANDICOTA, Gray, Ann. & Mag. N. H. (4) xii. p. 418 (1873).

Type. "*Bandicota gigantea*," i. e. *B. bandicota*, Bechst.

Skull comparatively long and narrow. Palatal foramina long. Molars most *Mus*-like.

Mammæ 3—3=12.

These three genera are specialized in the order given, *Nesokia* being the most extreme and the farthest from *Mus*, both in skull, tooth-structure, and external characters, and *Bandicota* the nearest, while *Gunomys* is intermediate between the other two.

Nesokia suilla, sp. n.

Nesokia Bacheri, Nehring, Anderson & de Winton, Zool. Egypt, Mamm. p. 286, pl. L. (1902).

Closely allied to *N. Bailwardi* ‡. Distinguished from *N. Bacheri* § by smaller size and smaller bullæ.

Colour and other external characters as in *N. Bailwardi*.

Skull, as compared with that of *N. Bailwardi*, averaging about the same size, but with various differences in detail. Zygomata more boldly expanded and forming a strongly convex shoulder opposite their anterior root, those of *N. Bailwardi* evenly broadening outwards to their posterior part.

* Bechstein's *Mus indicus* being now removed, as a *Bandicota*, from the genus *Nesokia*, the specific term given by Gray and Hardwicke again becomes tenable for the animal usually known as *Nesokia Hardwickei*. The same specimen (B.M. no. 99 a) is the type of both names.

† γούρος, fruitful, prolific.

‡ *Suprà*, p. 199.

§ Dr. Nehring (SB. Ges. nat. Fr. Berl. 1901, p. 219) states that the type of Wagner's "*Meriones myosuros*," which is a *Nesokia*, is of the same size as *N. Bacheri*. It would therefore be larger than either *N. Bailwardi* or *N. suilla*.

Nasals decidedly longer, broadened and projected forward anteriorly, then abruptly narrowed posteriorly in their middle third, and running backwards to a point, their edges, behind the anterior third, very faintly concave. Supraorbital ridges, even in the oldest specimens, not so thick as in *N. Bailwardi*. Interparietal smaller. Bullæ as in *N. Bailwardi*, conspicuously smaller than in *N. Bacheri*. Molars larger than in *N. Bailwardi*, the crown measurement of an immature specimen 7.6 mm., as against 6.5 in that animal (9.0 in *N. Bacheri*).

Dimensions of the type (measured in skin):—

Head and body 185 mm.; tail 113; hind foot 32; ear 16.

Skull: condylo-basal length 44.5; basilar length 39; zygomatic breadth 27; nasals, length 15, anterior breadth 5, middle breadth 3.6; interorbital breadth 6.1; interparietal 3.2 × 6; palatilar length 24.5; diastema 15.5; palatal foramina 6.2; length of upper molar series (crowns) 7.8, (alveoli) 8.8.

Hab. Eastern Egypt. Type from Shaluf, Suez.

Type. Old male. B.M. no. 4.8.2.29. Original number 59. From the collection of the late Dr. John Anderson; presented by Mrs. Anderson.

Several examples of the Egyptian *Nesokia*, all agreeing in the above-mentioned characters, have now been received by the Museum. Besides Dr. Anderson's original series there are three, purchased alive in Cairo by the Hon. N. C. Rothschild, and one, said to be from the Fayoum, presented by Capt. S. S. Flower.

Gunomys varius, sp. n.

The Malay representative of *G. bengalensis*.

Size decidedly larger than in *G. bengalensis*. Fur very coarse and harsh, though not to be called spiny; freely mixed with longer piles attaining 3–4 cm. in length. General colour above coarsely mixed black and cream-buff, without the brown tints of *G. bengalensis*. Individually the ordinary hairs are slaty at base, black at tip, with a broad cream-buff subterminal band; the longer piles black, a few of them white. Under surface dull grizzled greyish, the slaty-grey bases of the hairs more conspicuous than their dull whitish tips. Head and dorsal line particularly heavily pencilled with black. Ears brown. Hands and feet brown on the middle of the metapodials, whitish laterally and on the digits. Tail well clothed with coarse hairs 2–3 mm. in length; dark brown above, rather paler below.

Skull similar in general characters to that of *G. bengalensis*, but larger and heavier throughout.

Dimensions of the type (measured in the flesh):—

Head and body 266 mm.; tail 197; hind foot 40; ear 19.

Skull: condylo-basal length 48; basilar length 43; greatest breadth 26·7; nasals $16 \times 5\cdot2$; interorbital breadth 6·5; frontal height* 15·5; palatilar length 25·5; diastema 16·3; palatal foramina $10 \times 2\cdot6$; length of upper molar series (crowns) 7·3, (alveoli) 8·5.

Hab. Georgetown, Pinang, Malay Peninsula.

Type. Adult male. B.M. no. 98.8.3.3. Collected 8th April, 1898, and presented by Capt. S. S. Flower.

This is the "*Mus setifer*, Horsfield," of Dr. Cantor's "List of Malayan Mammals"†, a specimen collected by him in Pinang having been received with the Indian Museum collections in 1879.

G. varius is distinguishable from *G. bengalensis* by its coarse fur, variegated colour, and comparatively large size.

Gunomys varillus, sp. n.

Like *G. varius*, but very much smaller.

Size very small, scarcely equalling the smallest S. Indian species of the genus. Fur coarse; longer piles almost confined to the posterior back. General colour above about as in *G. varius*, or rather more buffy, but the mixture is finer, not so coarsely variegated. Under surface dull greyish, the hairs slaty at base, dull creamy terminally. Hands and feet brown. Tail more finely scaled than in *G. varius*, uniformly brown.

Skull very much smaller in all dimensions than that of *G. varius*, but essentially similar in form. Nasals short and narrow. Supraorbital ridges less heavily developed. Anterior zygomatic plate well projected forwards, much more so than in the equally small S. Indian *G. kok*. Palatal foramina of equal breadth for their anterior two-thirds, narrowed in their posterior third.

Dimensions of the type (measured in skin):—

Head and body 184 mm.; tail 137; hind foot 36·5; ear 16.

Skull: condylo-basal length 40·5; basilar length 35; greatest breadth 23; nasals $13 \times 4\cdot3$; interorbital breadth 5·7; frontal height 12·5; palatilar length 21; diastema 13; palatal foramina $8 \times 2\cdot4$; length of upper molar series (crowns) 7, (alveoli) 8.

* From the supraorbital ridge to the alveolus between *m*¹ and *m*².

† J. A. S. B. xv. p. 254 (1846).

Hab. Georgetown, Pinang.

Type. Adult male. B.M. no. 98.8.3.5. Collected and presented by Capt. S. S. Flower. Another specimen obtained by Dr. Cantor.

Both Dr. Cantor in 1845 and Capt. Flower half a century later obtained in the little island of Pinang examples representing two species of this genus, a large and a small. The former marked both his specimens as "*Mus setifer*," evidently taking them for the same species, but there cannot be the slightest doubt that they are quite distinct animals, their difference in size being far too great to be due to individual variation.

Mus Rogersi, sp. n.

A spinous-haired species with $1-3=8$ mammæ.

Size of *Mus norvegicus*. Fur coarse, profusely mixed with spines, which on the back are about 16 mm. in length by 0.4 mm. in breadth. General colour coarsely grizzled ochraceous brown, the bases of both hairs and spines pale grey, the tips of the spines black and of the ordinary hairs ochraceous. The few long bristle-hairs are wholly black. Sides greyer. Under surface not sharply defined, pale buffy greyish, the hairs pale slaty at base, dull cream-buff terminally. Ears finely haired, dark grey. Limbs dark grey externally, light grey like belly along their inner aspect. Hands and feet white above, the metapodials slightly darker; fifth hind toe, without claw, reaching to the end of the first phalanx of the fourth. Tail rather shorter than head and body, almost naked; rings of scales about 10 to the centimetre; dark brown above, whitish flesh-colour below. Mammæ $1-3=8$.

Skull strongly built, with well-marked supraorbital beads, which are continued across the parietals to the corners of the interparietals. Muzzle rather narrow, parallel-sided. Palatal foramina not reaching back to the level of the molars. Mesopterygoid fossa broadly rounded in front, its anterior limb slightly anterior to the front end of the parapterygoid fossæ on each side of it. Bullæ of medium size. Molars small in proportion to the general size.

Dimensions of the type (measured on the spirit-specimen before skinning):—

Head and body 195 mm.; tail 188; hind foot (s. u.) 41; ear 28.

Skull: greatest length 48.5; basilar length 40; zygomatic breadth 22.5; nasals 18×5 ; interorbital breadth 7.2; greatest separation of parietal ridges 16; palatilar length

23.3; diastema 14.2; palatal foramina 9.2; length of upper molar series 7.8.

Hab. W. Coast of South Andaman Island, north of Iké Bay.

Type. Adult female. B.M. no. 6. 4. 13. 2. Collected February 1904, and presented by C. G. Rogers, Esq.

In spite of the number of rats recently described by Mr. G. S. Miller* from the Andaman group, this fine species does not appear to have been previously obtained. Its very unusual mammary formula, 1—3=8, is alone shared, in the whole of the Muridæ, by *Mus bagobus*, Mearns, from the Philippines, and *Mus pulliventer*, Miller, from the Nicobars, of which latter it may be the Andaman representative, but from which it differs by its markedly larger size and distinctly bicolor tail.

XXXI.—On some British Polyzoa. By Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Plate IX.]

Micropora impressa (Moll). (Pl. IX. figs. 1–3.)

1803. *Eschara impressa*, Moll, *Eschara*, p. 51, pl. ii. fig. 9.

1841. *Eschara andegavensis*, Michelin, Icon. Zoophyt. p. 329 (nec auct. plur.).

1848. *Cellepora gracilis*, Reuss, Foss. Polyp. des Wiener Tertiärbeckens, p. 93, pl. xi. fig. 12 (nec Von Münster).

1854. *Membranipora calpensis*, Busk, Brit. Mus. Cat. p. 60, pl. civ. figs. 5, 6.

1867. *Membranipora bifoveolata*, Heller, Bryozoen des adriatischen Meeres, p. 19, pl. ii. fig. 1.

1871. *Membranipora calpensis*, Manzoni, "Supp. alla Fauna Bryoz. Medit.," Sitz. k. Akad. d. Wissensch. vol. lxi. p. 3, pl. i. figs. 2, 3.

1879. *Micropora impressa*, Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 123.

I have recently found among material put by for further examination a little box which contained three small pieces of the above Polyzoon, and labelled Guernsey. I cannot recall to mind whether I procured these specimens myself at Guernsey in 1865 or whether they were given to me.

Other specimens are in my collection from Naples, where I found it in 1887 to be abundant, and from the Adriatic, given to me by my late friend Professor Heller under his name "*Membranipora bifoveolata*."

* Pr. U.S. Nat. Mus. xxiv. p. 758 (synopsis of species) (1902).

Genus TEREBRIPORA, d'Orbigny.

This interesting genus, the exact position of which cannot be determined until the animal shall have been examined, but which is presumed to be a burrowing Polyzoan, was instituted by d'Orbigny in 1841 * to include two species, *Terebripora ramosa* and *T. irregularis*, which he had found in shells of *Calyptraea*, *Crepidula*, and *Pecten* off the South-American coast.

In 1865 Paul Fischer published an excellent paper on the family †, in which he enumerates all the species both recent and fossil presumed to be referable to his "Famille des Térébriporides." In this paper eight recent and fourteen fossil species are recorded. Two of the recent species had been found in European seas—one, *Terebripora Orbigniana*, Fischer, burrowing in shells of *Ostrea edulis* at Arcachon, and in *Conus mediterraneus* and *Triton nodifer* in the Mediterranean; the other, *Spathipora sertum*, Fischer, found at La Rochelle, Arcachon, and the Mediterranean in shells of *Lutraria elliptica*, *Cardium norvegicum*, *Pectunculus glycimeris*, and *Triton nodifer*. In 1880 M. J. Jullien ‡ added another recent species, *T. Fischeri*, which was found in a shell of *Buccinum* from Cape Verd Islands.

Terebripora ditrupæ, sp. n. (Pl. IX. figs. 4-7.)

Terebripora has a mode of growth analogous to that of *Hippothoa divaricata*, but instead of running over the surface of shells &c. as in the latter species, the whole polyzoary is buried in its substance, except that the orifices of the zoëcia open through the surface. The thread-like connecting fibres or stolons in all species hitherto described appear to be quite simple, but in *T. ditrupæ* they consist of lines interrupted on one side by small lateral projecting processes (fig. 5). The zoëcia are not in the same plane as the connecting fibre, but at right angles to it, in such a manner that they are also perpendicular to the surface (fig. 6). Owing to this position of the zoëcia their lower portion is too deeply seated to be seen with the microscope; the oral opening has a somewhat

* d'Orbigny (A.), 'Voyage dans l'Amérique méridionale,' vol. vi. p. 23, pl. x.

† Fischer (P.), "Étude sur les Bryozoaires perforant de la Famille des Térébriporides," Nouv. Arch. du Museum, vol. ii. pp. 293-313, pl. xi.

‡ Jullien (J.), "Desc. nouv. Espèce de Bryzoaire perforant du genre *Terebripora*, d'Orbigny," Bull. Soc. Zool. de France, 1880, pp. 1-4 and woodcut (separate copy).

irregular margin, but would appear to have a lip-like projection (fig. 7).

The calcareous shells of the Annelidan genus *Ditrupa* are dredged in extraordinary profusion on some parts of the "Haaf" off Shetland. I had saved a large box full of specimens of these, selected on account of encrusting growths on them, mostly of Polyzoa. On examining the contents of this box, which contained at least two thousand *Ditrupæ*, I discovered in one specimen the *Terebripora* which I have here described.

Schizoporella Alderi (Busk).

This species is subject to some variation in its mode of growth and in the absence or presence of lateral avicularia. It has been several times described. The original illustrations of Busk are very good. The following will give the synonymy of the species :—

Var. a.—Chain-like growth ; without avicularia.

1856. *Alysidota Alderi*, Busk, Quart. Journ. Micr. Sci. vol. iv. p. 311, pl. ix. figs. 6, 7.

1869. *Alysidota Alderi*, Norman, "Last Report Dredging Shetland," Brit. Assoc. Rep. for 1868, p. 306.

Var. b.—Chain-like growth ; with avicularia. (Chiefly arctic, rare Shetland.)

1867. *Mollia vulgaris*, forma *ansata* (partim), Smitt, "Kritisk Förteck. &c.," Öfvers. K. Vet.-Akad. Förhand. p. 15, pl. xxv. fig. 81.

1880. *Schizoporella Alderi*, Hincks, Hist. Brit. Marine Polyzoa, p. 243, pl. xxxvi. figs. 9, 9 a.

Var. c.—Clustered growth ; without avicularia. (Shetland, &c.)

1860. *Lepralia Barleei*, Busk, Quart. Journ. Micr. Sci. vol. vii. p. 143, pl. xxvi. figs. 1, 2.

1867. *Mollia vulgaris*, forma *ansata* (partim), Smitt, *l. c.* figs. 79, 82.

1880. *Schizoporella Alderi*, Hincks, *l. c.* fig. 10.

Var. d.—Clustered growth ; with avicularia. (Arctic.)

1867. *Mollia vulgaris*, var. *ansata* (partim), Smitt, *l. c.* fig. 80.

1900. *Schizoporella Elmwoodice*, Waters, "Bryozoa from Franz Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 66, pl. ix. figs. 1 & 13.

1905. *Schizoporella Stormi*, Nordgaard, Hydrog. and Biol. Invest., Invert. Norweg. Fiords, p. 166, pl. v. figs. 1, 2.

1906. *Schizoporella Elmwoodice*, Kluge, Ergänzz. u. die 'Olga' Exped. gesamm. Bryozoen, p. 40.

1906. *Schizoporella Stormi*, Nordgaard, Bryozoa from Second 'Fram' Exped. 1898-1902, p. 17, pl. i. figs. 10, 11.

The following examples are in my collection :—

Var. a. Alderi.—Shetland (types *Barlee*) ; Shetland and Bergen Fiord (*A. M. N.*).

Var. b.—Shetland (with *Barlee*'s types).

Var. c. Barleei.—Shetland (types *Barlee*) ; Shetland and Bergen Fiord (*A. M. N.*) ; 'Porcupine,' 1869 ; Spitsbergen (*Smitt*, as "*Mollia vulgaris*, forma *ansata*").

Var. d. Elwoodiæ.—Grey Hook, Spitsbergen, 90 fath. (*Smitt*, as *Mollia vulgaris*, var. *ansata*) ; Hammerfest (*Nordgaard*, cotypes of *Schizoporella Stormi*).

Escharina Dutertrei (Audouin). (Pl. IX. figs. 8-12.)

Mastigophora Dutertrei, Hincks, Hist. Brit. Marine Polyzoa, p. 279, pl. xxxvii. figs. 1, 2.

Hincks describes two forms of this species, to which I would call a little more attention. The Shetland form, which is abundant there in 80-170 fathoms (figs. 8, 9), has the zoœcia tumid, the surface somewhat roughly granulated, with a tendency in the granulations to arrange themselves in radiating lines ; six mouth-spines are developed ; the vibracula are of moderate length ; the incision of the lip has the angles generally rounded off. In one of the 'Porcupine' dredgings of 1869 the Shetland form just noticed occurred in abundance, but with these were also two specimens which had a very different aspect. The zoœcia were much longer (fig. 10 as compared with fig. 8, both drawn with the same magnifying-power) and much more flattened ; the vibracula were very long, but there were no mouth-spines, while the incision of the lip had the angles sharply defined. In the Antrim variety described by Hincks the zoœcia are not so large, but they are nearer this second variety, since they are similarly flattened and have the oral opening of similar form (see fig. 12). I have an allied form from Madeira, which is probably that which has been more than once recorded as *L. Dutertrei*. It is smaller, much more tumid, and the vibracula arise from elevated shoulders. It may be a distinct species.

Phylactella pygmæa (Norman).

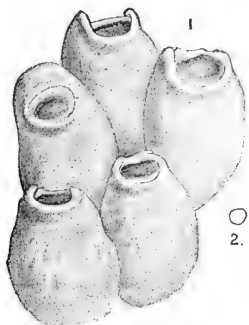
1869. *Celleporella pygmæa*, Norman, "Last Report Dredging Shetland," Brit. Assoc. Report for 1868, p. 303.

1880. *Celleporella pygmæa*, Hincks, Hist. Brit. Marine Polyzoa, p. 415.

As has been already recorded by Hincks, this minute

Polyzoon has been dredged by me in 80–170 fathoms off Shetland and also in deep water in Bergen Fiord. The late Mr. C. Peach also sent me a specimen taken by him off Wick, and it was also procured by the 'Porcupine' Expedition of 1869.

As the species has not been figured, it is illustrated here in the annexed woodcut. I have nothing to add to the description which has already been given. I have provisionally placed the species in the genus *Phylactella*, as, perhaps, it comes nearer to *P. collaris* than to any other form; but it has little in common with the type of that genus, *P. labrosa*. The small size of the zoœcia may be judged by fig. 2, which represents the outline of a zoarium which will contain forty to fifty zoœcia.



1. *Phylactella pygmaea* (Norman).

2. Size of a zoarium.

Cellepora surcularis (Packard).

1856. *Cellepora cervicornis*, Busk, Ann. & Mag. Nat. Hist. ser. 2, vol. xviii. p. 32; and 1858. Mon. Fossil Polyzoa of the Crag, p. 57; and 1880. Journ. Linn. Soc., Zool. vol. xvi. p. 238, pl. xiii. figs. 6–8 (nec *Cellepora cervicornis*, Johnston).
 1863. *Celleporaria surcularis*, Packard, "List of Animals dredged near Caribou Island," Canadian Naturalist, vol. viii. p. 410; and 1867. "Obs. Glacial Phenomena of Labrador and Maine," Mem. Boston Soc. Nat. Hist. vol. i. p. 274.
 1867. *Cellepora incrassata*, Smitt, "Krit. Förteck. &c.," Öfvers. K. Vet.-Akad. Förhand. p. 33, pl. xxviii. figs. 212–216 (nec *Cellepora incrassata*, Lamk.).
 1886. *Cellepora cervicornis*, Lorenz, Bryozoën von Jan Mayen, p. 13, fig. 12.

A young specimen of this species encrusting stone and

embracing an upright growing *Serpula* was dredged by the 'Porcupine' in 1869. The station was not preserved, but a box contained a large number of stones the numerous species encrusting which were, with the one exception of this *Cellepora*, identical with the deep-sea fauna of Polyzoa with which I am so familiar in the Shetland seas; and there can be little doubt but that the species was taken within the British area. The species along with it were *Amphiblestrum trifolium*, *Escharina Dutertrei*, *Ramphonotus minax*, *Megapora ringens*, *Anarthropora monodon*; "*Schizoporella*" *ansata*, *Alder*, and *sinuosa*; *Porella bella*; *Escharella abyssicola*, *laqueata*, and *microstoma*; *Hemicycloporella polita*, &c.

EXPLANATION OF PLATE IX.

- Fig.* 1. *Micropora impressa*, Moll.: a living zoecium.
Fig. 2. Ditto: a dead zoecium.
Fig. 3. Ditto: operculum.
Fig. 4. Shell of *Ditrupa arietina* (Müller).
Fig. 5. Segment of this shell magnified, to show the perforations of *Terebripora ditrupæ*.
Fig. 6. *Terebripora ditrupæ*, sp. n.: upper portion of a zoecium.
Fig. 7. Ditto: oral aperture of zoecium.
Fig. 8. *Escharina Dutertrei*, Audouin, the deep-water Shetland form.
Fig. 9. Ditto, its operculum.
Fig. 10. Ditto: variety taken in company with the last.
Fig. 11. Ditto: ditto, its opercula.
Fig. 12. Ditto: oral opening of a specimen from the Antrim coast.

XXXII.—Three new Spanish Insectivores.

By ANGEL CABRERA.

AMONG a number of Spanish small mammals lately arrived for my private collection there are a few apparently new forms of Insectivores that I now propose to describe. Some of them are also represented in the Natural Science Museum of Madrid.

Talpa cæca occidentalis, subsp. n.

Characters. A small form of *T. cæca*, with a flatter, but not lower, skull, and very hairy tail and feet. Width of fore foot considerably greater than its length without nails.

Colour. Brownish black, the hairs being dark silvery grey with deep brown tips. Middle of under surface without the last colour, the general hue becoming dark silver-grey. Hairs of the tail very long, black; those of the feet very

dark brown. The fur is very glossy, showing silvery reflections in certain lights; if wet, it exhibits a brilliant metallic lustre, green on the upper surface, dark purple on the belly.

Skull. Similar to that of typical *cæca*, but the brain-case, although rather high (more than 9 mm.), is flatter on the upper surface, so that, viewed from behind, its greatest breadth appears above the middle horizontal line of the skull, as in *T. c. levantis*.

Measurements (type in flesh). Head and body 102 mm.; tail 24; fore foot, breadth 17·6, length (s. u.) 15·5; hind foot (s. u.) 15·5.

Skull: greatest length 31·5; basal length 22·5; zygomatic breadth 11; breadth of brain-case 15·2; palatal length 14; upper tooth-row 13·5.

Habitat. Guadarrama Mountains, Central Spain. Alt. 1200–1300 m.

Type. Adult male, from La Granja (Segovia), collected by Sr. M. de la Escalera, September 1906. No. 122, collection of A. Cabrera.

Remarks. By its smaller size this mole is easily distinguishable from the Italian and Asiatic forms, in which the head and body length exceeds 120 mm. It therefore appears to need a subspecific name.

Crocidura russula pulchra, subsp. n.

Characters. A small, long-tailed shrew, like *C. mimula* in size, but with a longer tail and the typical skull of *C. russula*.

Colour. Upperparts pale sepia, with a very slight reddish tinge, and showing bright silvery reflections on the back. Ventral surface ashy white. The hairs are everywhere dark slate at the base, and this colour appears externally on the underparts. Tail sepia above, dirty white below.

Skull. The skull and teeth are identical in form with those of *C. russula russula*, but a little smaller.

Measurements (type in flesh). Head and body 71 mm.; tail 41·5; hind foot (s. u.) 12; ear 8.

Skull: greatest length, exclusive of incisors, 18·9; breadth of brain-case 9·1; greatest antorbital breadth 6; interorbital breadth 4·2; upper tooth-row 8·4.

Habitat. Eastern Spain, Valencia. A specimen from Minorca (Balearic Islands) in the Madrid Museum belongs probably to the same form.

Type. Adult male, from Valencia, collected by Sr. José M. Benedito, January 1907. No. 117, collection of A. Cabrera.

Remarks. I think it best to treat this form as a subspecies until the true relationship of the different shrews of the *russula* group is made out. It is noteworthy that almost all the southern forms of this group (*cypria*, *monacha*, *caudata*, *pulchra*) have a remarkably long tail.

Neomys anomalus, sp. n.

Characters. Smaller than typical *N. fodiens*; tail rounded, its lower surface without a keel of hairs.

Colour. Upperparts glossy brownish black, the hairs being dark iron-grey with reddish-black ends. Underparts white, slightly washed with yellowish under the neck; the white sharply separated from the dark colour on the sides. Hands and feet white, the latter with a blackish patch running from the heel along the posterior half of the external border. The long hairs fringing the foot white. Tail bicolor, brownish black above, white below; the hair on its lower surface long enough to mask the scales, but not to form a fringe as in *N. fodiens*; it is only a little elongated about the end, hardly forming an inconspicuous terminal tuft.

After a long immersion in alcohol the colour of the dorsal surface of the body becomes a dark reddish chestnut.

Skull. Compared with *N. fodiens*, the brain-case is higher and less rounded, its anterior part being not convex, but forming a smooth slope. The occiput is also flatter in its upper part. The teeth show no peculiarities.

Measurements (type, after a short immersion in alcohol). Head and body 73 mm.; tail 60; hind foot (s. u.) 17.5; ear 8.

Skull: greatest length, exclusive of incisors, 20.5; breadth of brain-case 10; greatest antorbital breadth 6.2; interorbital breadth 4; upper tooth-row 9.6.

Habitat. Central Spain. I have seen specimens from Salamanca and Madrid provinces.

Type. Adult male, from San Martin de la Vega (province of Madrid, on the Jarama River), collected in December 1892. No. 1140, Museum of Natural Science of Madrid.

Remarks. This *Neomys* is not alone in the lack of a hairy keel under the tail. The same peculiarity has been found by Mr. Charles Mottaz in another new form from the Vaud Alps, Switzerland. Mr. Mottaz has kindly sent me a specimen (skin and skull) and an unpublished description of his animal, and from comparison it results that both the Swiss and the Spanish forms, although similar in the tail-structure, are very different in other points. In the same season the

hair of the Swiss form is shorter and greyer than that of *N. anomalus*. The brain-case of the skull in the former species is rounded and somewhat globular, while in the Spanish animal it is flat in the anterior part and about the occiput, the entire outline being not evenly convex, but nearly angular.

Owing to the absence of hair-fringe on the under surface of the tail, *N. anomalus* has hitherto been confounded by Spanish naturalists with *Sorex araneus*, a species that I have never seen in the Peninsula. Under that name the specimens in the Madrid Museum were exhibited.

XXXIII.—*On Four new Pill-Millipedes from the Malay Peninsula and Siam.* By A. S. HIRST (British Museum, Nat. Hist.).

[Plate X.]

THE four forms which I describe below as new seem to be somewhat closely allied to one another. Their copulatory feet present much resemblance and the walking-legs in all four species are furnished with three spines above the claw. Three of them come from the Malay Peninsula, and the remaining one from Siam. *Z. anthracina*, Pocock, from the Malay Peninsula, *Z. impunctata*, Pocock, from Penang, and *Z. semilævis*, Pocock, from South Tenasserim, are also members of this species-group. The legs of these last species were described by Mr. Pocock * as being provided with two spines above the claw; in reality, however, they are provided with three.

Zephronia rugulosa, sp. n.

Colour (faded, in spirit). Head, nuchal plate, and the first tergite dark brown or black: tergites dark brown, the anterior borders yellowish brown and ornamented with several small dark spots †; the last tergite with irregular dark spots.

Head. Anterior region of the head marked with fairly numerous punctures, the posterior part sparsely punctured. The anterior border with a single tooth.

Nuchal plate with sparse and fine punctures.

First tergite convex anteriorly, the usual angle being almost

* Ann. Mus. Civ. Genova, ser. 2, vol. x. no. 30, p. 5 (1890); Ann. & Mag. Nat. Hist. ser. 6, vol. xvi. p. 413 (1895).

† These spots are probably due to bad preservation.

rounded off and effaced; marginal excavated area in the form of a narrow groove expanding a little anteriorly and confined to the lateral part of the tergite. The two lateral depressed areas punctured and connected with one another by a narrow transverse strip, which is finely punctured but not hollowed out.

Tergites. Punctures almost absent; the anterior margins roughened and granular; last tergite minutely punctured in its anterior half.

Legs provided with three spines above the claw.

Copulatory feet. Anterior forceps with the immovable finger short, much curved, and flattened, the hollowed-out inner surface bearing a membranous tooth; movable finger straight and composed of two segments; the proximal segment with the upper inner corner projecting and almost rectangular; distal segment with a spine on the inner side. Posterior forceps with the immovable finger stout and bearing a forked membranous tooth on the inner edge; movable finger stout, curved, and composed of two segments (figs. 6-8).

Measurements in mm. Total length 53.5, middle breadth 29.5.

Hab. Pahang, Malay Peninsula. Three specimens collected by Mr. Craddock. (Brit. Mus. Coll.)

The following form is apparently a local variety of the above species:—

Colour (in spirit). Head and nuchal plate black; first tergite black, with the exception of the middle lateral area, which is yellowish brown: tergites with the posterior two thirds dark, the anterior border yellow; last tergite black, with a narrow yellow border posteriorly.

Nuchal plate smooth, the punctures minute and very sparse.

First tergite (fig. 1).

Tergites with the anterior margins but little roughened.

Legs with 3-4 spines above the claw.

Copulatory feet. Proximal segment of movable finger of anterior forceps with the angular projection sharper, less rectangular, and more conical than is the case in the form from Pahang (fig. 9).

Measurements in mm. Total length 43.5, middle breadth 25.

Hab. Kelantan (Mr. J. D. F. Gimlette). (Brit. Mus. Coll.)

Zephronia Ridleyi, sp. n.

Colour (in spirit). Head and nuchal plate black: tergites

dark green, the anterior margins pale yellow; first tergite with the anterior and posterior margins black and the middle part yellow.

Head. Anterior part of head furnished with many hairs, the posterior part with a few scattered hairs.

Nuchal plate with a few fine hairs.

First tergite smooth and shining anteriorly, posteriorly with many minute punctures. Lateral depressed area in the form of a very narrow groove, which becomes enlarged in its inner anterior portion; the depressed areas of the two sides are not continuous (fig. 2).

Tergites. Anterior third of tergites finely roughened and very minutely and densely punctured. The rest of the surface without granules, the middle part being marked with fine and numerous punctures, the posterior part more sparsely punctured. Last tergite minutely punctured.

Legs provided with three spines above the claw.

Copulatory feet. Anterior pair with the immovable finger of the forceps short, flattened, strongly curved, and bearing a membranous conical tooth on the inner side; movable finger straight, of much greater length than the immovable finger and composed of two segments, the distal one being of moderate size, the proximal one with the upper inner angle large and projecting. Posterior pair with the immovable finger bearing a bifid membranous tooth on the inner edge; movable finger bisegmented, a little curved, and fairly stout (figs. 10 & 11).

Measurements in mm. Total length 34, breadth 19.

Hab. Selangore (in a cave). A single specimen was collected by Mr. H. N. Ridley during the year 1897. (Brit. Mus. Coll.)

Zephronia Floweri, sp. n.

Colour deep brown.

Head with punctures bearing hairs anteriorly, posteriorly with a few scattered hairs.

Nuchal plate smooth, the anterior and posterior margins with minute punctures, however.

First tergite provided with a smooth, transverse, almost keel-like elevation, which is situated posteriorly to the anterior groove or depression, and forms its boundary, the ridge itself being limited posteriorly by a narrow lineal groove (sometimes indistinct) terminating laterally in diverging lines similar to those present in *Z. nigriceps*, Pocock (fig. 3).

Ann. & Mag. N. Hist. Ser. 7. Vol. xx. 15

Tergites smooth, devoid of granules, and ornamented with a fine scale-like sculpturing, punctures absent.

Legs provided with three spines above the claw (fig. 13).

Vulva. Distal sclerite reduced to a band or strip, which increases in length (antero-posterior) towards the inner angle (fig. 12).

Measurements in mm. Total length 41, middle breadth 19.

Hab. Singapore. Two specimens collected by Capt. S. S. Flower. (Brit. Mus. Coll.)

Zephronia siamensis, sp. n.

Colour (in spirit). Dark green, the tergites usually ornamented in the middle part of their anterior half with two clear yellow patches and with a transverse stripe occupying the middle part of the posterior border. In many specimens, however, the anterior and posterior markings are fused together, leaving a dark green spot (often triangular in shape) in the middle of the tergite.

Head. Anterior part of the head with many small hairs, the posterior part sparsely punctured; the anterior margin with a single tooth.

Nuchal plate unpunctured or sparsely punctured.

First tergite with the depressed area rather narrow in its lateral portion and connected by a still narrower and shallow strip with the area of the other side; lateral portions of depressed area and the connecting strip covered with dense hair. A smooth and unpunctured transverse strip of the surface is situated posteriorly to the depressed area, the rest of the tergite being hairy (fig. 4).

Tergites densely covered with minute hairs (in worn specimens densely and minutely punctured).

Legs provided with three spines above the claw.

Copulatory feet. Immovable finger of anterior forceps flattened, much curved, and bearing a membranous process on the inner side; the movable finger fairly stout and very indistinctly bisegmented, the serrations of the inner side of the lower segment ending in a slight projection. Immobile finger of posterior forceps provided with two membranous teeth; the movable finger curved, of moderate stoutness, and composed of two segments (figs. 14 & 15).

Vulva with the distal piece or cap increasing in size towards the inner side, where, however, it is nearly twice as broad as long; the outer corner narrowed and extending a little down the outer side of the proximal segment. Lower segment with the opening long and V-shaped, the point of

the V (which is continued some distance as a groove) being directed towards the lower inner corner (fig. 16).

Measurements in mm. Length 26·5, middle breadth 12·5.

Hab. Kosichang and Chantaboon, Siam. A large number of specimens collected by Capt. S. S. Flower. (Brit. Mus. Coll.)

EXPLANATION OF PLATE X.

- Fig.* 1. *Zephronia rugulosa*, var. First tergite.
Fig. 2. *Zephronia Ridleyi*, sp. n. First tergite.
Fig. 3. *Zephronia Floweri*, sp. n. First tergite.
Fig. 4. *Zephronia siamensis*, sp. n. First tergite.
Fig. 5. *Zephronia impunctata*, Pocock. First tergite.
Figs. 6, 7. *Zephronia rugulosa*, sp. n. Anterior copulatory forceps.
Fig. 8. Ditto. Posterior copulatory forceps.
Fig. 9. *Zephronia rugulosa*, var. Anterior copulatory forceps.
Figs. 10, 11. *Zephronia Ridleyi*. Anterior copulatory forceps.
Fig. 12. *Zephronia Floweri*. Vulva.
Fig. 13. Ditto. Walking-leg.
Fig. 14. *Zephronia siamensis*. Anterior copulatory forceps.
Fig. 15. Ditto. Posterior copulatory forceps.
Fig. 16. Ditto. Vulva.

XXXIV.—Description of an apparently new *Lycænid* from Mauritius. By HAMILTON H. DRUCE, F.Z.S., F.E.S.

LIEUT.-COL. N. MANDERS, whilst residing in Mauritius, collected a series of a *Lycænid* which I am unable to determine and which he has asked me to describe. It is not included in Boisduval's work on the Lepidoptera of the island and is not mentioned by Dr. Trimen in his list. At first sight I thought it would be well placed in Dr. Butler's genus *Cycliyrus*, but the coloration of both sexes is so different from the typical species of that genus (*C. Webbianus*, Brullé)—it is also without the chequered cilia—that it seems to me better placed amongst the tailless group of *Nacaduba*, some species of which it much resembles on the upperside.

Nacaduba Mandersi, sp. n.

♂.—Upperside uniform dull violaceous blue; costal and outer margins very narrowly greyish brown. Cilia paler. Underside: ground-colour pale brownish grey with irregular, darker, sordid-white edged spots and markings. Fore wing: an elongate spot crossing the middle of the cell, followed by another much the same closing its end. Beyond this an

ultramedian band of ovular spots commencing just below the costa and reaching to the submedian nervure, that portion of it which is opposite the cell being placed further outwards towards the apex. A dark anteciliary line followed by a row of minute dark lunules inwardly bordered with sordid white. Hind wing: several irregular spots near the base and along the anal margin, and beyond these an irregular much broken band of spots commencing on the costa, becoming divided on the disc, and angled to the anal margin. A dark anteciliary line and shades as in fore wing. There are three deep black marginal spots (the centre spot being the largest) supporting metallic-blue scales and ringed with pale orange situated in the three anal nervular interspaces. Cilia of both wings grey.

Palpi black above, clothed with black and white hairs below. Thorax and abdomen below more or less clothed with whitish hairs.

When examined with a glass the whole surface of both wings below appears to be suffused with sordid white scales.

♀.—Upperside: fore wing bright blue, with the costa, apex, and outer margin blackish brown. Hind wing blackish brown, slightly paler along the costal edge; the basal third bright blue. Three dark marginal spots in the anal interspaces crowned with bright blue. Cilia of both wings brown, paler towards apex of hind wing.

Underside as ♂, but ground-colour darker and spots more prominent.

Expanse, ♂ ♀, $1\frac{1}{2}$ inch.

Hab. Mauritius.

Types, ♂ ♀, coll. Manders. Co-types in B.M.

Also in coll. Druce, presented by Lieut.-Col. Manders.

The species is without tails.

Lieut.-Col. Manders writes that it flies all the year round, except in the coldest weather, there being a succession of broods. He did not find it in the Island of Réunion.

XXXV.—*On an Extinct undescribed Fruit-Bat of the Genus Pteropus from the Mascarenes.* By GEO. E. MASON.

A CURSORY survey of the small island known as La Ronde, laying about 15 miles north-east of Mauritius, was made a year ago by a South African syndicate interested in the guano trade, and on the face of a deep-wooded gorge situated in the central part of the island numerous fissures were met with containing a superficial deposit of red earth, from

which a member of the survey collected and transmitted to me the specimens forming the subject of this communication. The material consists of a skull, the right and left femur, and portion of the humerus, all of which can most certainly be attributed to the same individual, and they clearly indicate a very characteristic and hitherto unrecorded species of frugivorous bat of the genus *Pteropus*, which has, however, now ceased to exist on the island, neither does it occur on any other of the Mascarene Islands. Associated with the remains were also found the bones of tortoises, birds, and introduced animals, the presence of these latter, which are referable to the goat (*Capra hircus*) and rabbit (*Lepus cuniculus*), being of particular interest and affording reliable data by which we may, with every degree of certainty, assign the age of the deposit to a period succeeding the advent of man in the island. Contemporary with *Didus*, *Pezophaps*, and other members of the then existing fauna of the Mascarenes, this bat must have long survived those forms, lingering on until a comparatively recent period, the state of preservation and general condition of the remains under discussion strongly bearing out this hypothesis. In seeking for a possible cause for its extinction it is perhaps, in this case, more reasonable to assign the chief weight to those changes in the conditions affecting a due and plentiful supply of the soft fruits and berries so essential for the sustenance of these voracious creatures, brought about by a series of dry or tempestuous seasons unduly prolonged, as the means of subsistence within the very restricted area of the island, even under most favoured influences, must have been very limited, rather than to the direct agency of man, which we know has been instrumental in bringing about the varied physical transitions and concomitant changes in the endemic animal life of the whole Mascarene group of islands as known to us at the present day.

For this interesting species I propose the name of

Pteropus mascarinus, sp. n.

Skull.—With moderately long but heavy muzzle, flattened and scarcely concave frontal region. Sagittal crest weakly developed, almost obsolete.

Measurements.—A few of the measurements can only be given approximately owing to the damaged condition of the specimen:—

Upper length (approximate) 49 mm.; condylo-basal length (approximate) 46; basilar length (approximate) 41; median palate length 28; breadth between outer sides of canines 9·8, inside canines 4·3; outside p. 4 13·8, inside p. 4 8; outside

m. 2 13, inside m. 2 9·2; zygomatic breadth (approximate) 27; least interorbital breadth 7·8; the dimensions of the structure behind postorbital process cannot be taken; greatest breadth of brain-case 15; occipital depth 11; mandible 40·6; maxillary tooth-row exclusive of incisors (alveoli) 20·1; mandibular tooth-row exclusive of incisors (alveoli) 22·3.

Teeth.—With the longitudinal grooving characteristic of the genus *Pteropus*, very strongly developed, somewhat large and heavy for the size of the animal; canines long and sharp, both above and below, with unusually acute and prominent postero-internal basal ledges, those of the maxillary in particular; first upper premolars very minute, but would have been still persistent in the type and standing in the tooth-row.

Measurements.—The sizes of the upper incisors and second upper molars are omitted, as these teeth are wanting in the specimen. Vertical length of upper canine 7·5 mm.; horizontal length of upper canine 3·5; horizontal length of p. 3 3·8, width 2·3; horizontal length of p. 4 3·8, width 3; horizontal length of m. 1 4·1, width 2·1. Lower teeth—combined breadth of incisors —?; height of canine (from basal ledge behind) 5; horizontal length of anterior premolar 2; of p. 3 3·8, width 2·1; horizontal length of p. 4 3·5; of m. 1 4·3, width 2; horizontal length of penultimate molar 3, width 1·8; horizontal length of m. 3 1·5, width 1·4.

Locality.—Round Island, North-east Mauritius.

As compared with the now existing *Pteropi* of the Mascarenes, this species occupies a place intermediate between *Pteropus vampyrus* and *Pt. rodricensis*, in size only, the dentition being typical of *Pteropus*, whereas the two above species fall into the subgenus *Spectrum*. The only other fruit-bat occurring in the Mascarenes is *Pt. rubricollis*, and this has been placed by Matschie in his subgenus *Sericonycteris*. A great analogy, in fact, exists between the dentition of *Pt. mascarinus* and those species of *Pteropus* (*tonganus*, *Gouldii*, and *conspicillatus*) inhabiting Australia and the islands of the Pacific Ocean.

The limb-bones call for no special description, the most perfect specimen being the right femur, which measures 40 mm.

Since the above was written a few additional bones referable to this new species, and representing two younger individuals, have been received. Their fragmentary condition has, however, failed to add any additional particulars to the above description of this interesting and lost species.

XXXVI.—*Brachiopod Nomenclature: Seminula, &c.*

By S. S. BUCKMAN, F.G.S.

IN this Magazine (vol. xviii. 1906, p. 324) I put forward certain views regarding the genus *Seminula*. In the same Magazine (vol. xix. 1907, p. 194) Dr. Vaughan contested my conclusions. I have also been favoured with certain verbal criticisms concerning them.

The gist of the verbal criticisms may be given first. They are to this effect—that *Terebratula pentaëdra*, Phillips, ought not to be taken as the type of *Seminula*: that M'Coy, in using a trivial name as a generic term, indicated exactly the type of his genus: that, therefore, *T. seminula* is the type of *Seminula*: that M'Coy himself subsequently confirmed this, as Dr. Vaughan points out. To which I may add that, if the type was considered doubtful before, then M'Coy becomes the first one to select a type to his genus; and that therefore subsequent authors are barred from selecting outside his limits.

The difficulty in this case is that M'Coy himself, when he made this selection, confused as *Seminula seminula* specimens of *Dielasma*; but we have it on Davidson's authority (Carb. Mon. p. 16) that the original of *Seminula pisum*, as M'Coy called Phillips's *Terebratula seminula*, is a *Rhynchonella* [*Camarophoria*]. As that is what M'Coy originally had in his hand in naming his species and genus, then if the views prevail that M'Coy's selection of a trivial name for a generic is a better indication of his type than his giving a figure, the type of *Seminula*, M'Coy, will be *T. pisum* = *Ter. seminula*. The result will be the same as in my previous paper—that *Seminula* is a genus akin to *Camarophoria*.

Now as to Dr. Vaughan's observations on *Ter. pentaëdra*. He says that the type of this species is in the British Museum; but I had come to the conclusion that this was not the type. This alleged type Dr. Vaughan says is conspecific with *S. ambiguus*: I find so many differences that I cannot regard it as congeneric. The most important point is the contour of the beak-region. In *S. ambiguus* the dorsal umbo is not prominent, and on each side of it the two valves join flush: it has a thorough Terebratuloid contour. In the "*T. pentaëdra*" the beak-region has what may be called a spiriferoid contour: the umbo is very prominent and the two valves join to make a flange each side of it, features which are seen in Spiriferids. These same features I find in the specimens accompanying the alleged *T. pentaëdra*:

eight of these Dr. Vaughan admits are fringed *Athyrids*—and I agree. I claim, however, that the alleged *T. pentaëdra* is also a fringed *Athyrid* in imperfect preservation; and Dr. Vaughan's statement (p. 196) that the remaining specimen in the series, which he says "approaches closely to the [alleged] type," does exhibit glabristriation supports this view. My contention is that these two specimens supplement one another; that they belong to a series of globose fringed *Athyrids* not yet generically distinguished; that they are allied, as the characters of their beak-regions show, to the *glabristria-Roysii* forms; and that they are generically separable from *S. ambiguus* by their beak-region characters. I have examined many specimens of *S. ambiguus*, some of which Dr. Vaughan kindly sent me; and the terebratuloid contour of the beak-region is very distinctive.

Composita.

The terebratuloid appearance of *S. ambiguus* struck Sowerby (Min. Conch. iv. p. 105), and the combination of *Terebratula* and *Spirifer* characters in the shell caused him to give a hint about constructing a new genus for it. Brown took the hint, and emphasized the composite character in his name. Dr. Vaughan says (p. 197) that Brown's figures represent *Spirifer glaber*: he gives as reasons the large size, the shape, and other characters. Brown's figures, however, are exactly the same size and shape as the larger of the syntypes figured in Sowerby's plate: in fact, Brown's figures are obviously made out of the details given by the four figures of Sowerby—the size and shape are taken from the larger figures, and the characters of the smaller figures have been enlarged to fit. Brown's fig. 4 (Foss. Conch. pl. liv.*) is obviously based on a tracing of the middle figure of Sowerby's plate: then the valve has been depicted from the outside—the details, even to a bit of coil seen through a break, being taken from the N.E. fig. of Sowerby's plate (Min. Conch. iv. pl. 376).

It is hardly necessary to pursue any further the idea that Brown figured *S. glaber* in this case; but in his pl. li. it may be seen how differently he did represent it.

Type Specimens.

Scepticism with regard to the identity of alleged type specimens is necessary, as I have shown before†. A case in point now concerns a Carboniferous species. In the

† Ann. & Mag. Nat. Hist. (7) vol. xiv. p. 392 (1904).

Sowerby Collection (British Museum, Natural History) under No. 43464 are four specimens—one in one box, three in another. The one alone is said to be the figured specimen of *Anomites crumena*, Martin (Petrif. Derb. pl. xxxvi. fig. 4); but Martin's figure is coloured light ochre, while this is a blackish-grey fossil of much smaller size and with less marked costæ. In the pedicle-valve of this blackish specimen I cannot find any mesial septum. It has the appearance of a Lower Lias *Rhynchonella*, and it is possibly the example mentioned by Sowerby as from Pickeridge (Min. Conch. i. p. 190).

Of the three specimens in a box, one is claimed as the original of the example of *T. crumena* figured by Sowerby in fig. 3 of pl. 83. This and another specimen in the box may both have supplied details of what is perhaps a composite figure—what Schuchert calls a synthetograph*. But these three specimens are not from Mountain Limestone as claimed: they are from Middle Lias Marlstone and are the well-known *Rhynchonella northamptonensis*, Walker. Davidson's Ool. & Lias. Brach., Suppl. pl. xxix. fig. 8, represents them exactly.

The T.-globata series.

The Inferior-Oolite and Fuller's-Earth species, which hitherto have been designated by the above term, form a remarkable group; but their identification with *Terebratula globata* is erroneous. It is necessary to revise.

Terebratula globata, J. de C. Sowerby.

1823. Min. Conch. pl. 436. fig. 1.

An examination of the types of the species shows that the identification usually made, on the lines of the specimen figured as *T. globata* by Davidson in Ool. & Lias. Brach., Suppl. pl. xvii. 3, is quite incorrect. Sowerby's species is a very globose, almost uniplicate, barely biplicate shell, not at all well depicted by Davidson, Ool. Brach. pl. xiii. 2, 3. Sowerby's species is the shell which the late J. F. Walker has for years distinguished and distributed by the MS. name of a village near Frome: that will be a guide to its identification in many cases.

I suspect that Dav. Suppl. pl. xvii. 5 is really *T. globata* and not *T. bullata*. These two species are remarkably alike: they are isochronous homœomorphs—members of two

* "Catalogue of Type Specimens," Bull. U.S. Nat. Mus. vol. liii. p. 15 (1905).

families. *T. globata* has much the appearance of my *T. withingtonensis**, but is much more tumid. It has the same peculiarly truncate beak.

This identification of *T. globata* leads to the following change of name:—

Terebratula nunneyensis, nom. nov.

1878. *T. globata*, Dav. (non Sow.) Ool. & Lias. Brach., Suppl. pl. xvii. 3.

Much more plicate, but much less tumid than *T. globata*. Common in the Fuller's Earth.

Various Cotteswold Inferior Oolite *Terebratulæ* were identified by Davidson with *T. globata*; but of late years it has generally been recognized that they themselves require to be separated as well as parted from *T. globata*=*T. nunneyensis*. They and *T. nunneyensis* belong to the same group; but the true *T. globata* belongs to quite a different series—that of *T. sphæroidalis*.

Terebratula cotteswoldensis, nom. nov.

1878. *T. globata*, var., Davidson (non Sow.), Suppl. pl. xvii. 1.

Like *T. intermedia*, Sow., but more plicate and much more tumid. Common in *Clypeus*-grit of the Cotteswolds.

Terebratula cheltensis, nom. nov.

1878. *T. globata*, Davidson (non Sow.), Suppl. pl. xvii. 2 (type); 1851, pl. xiii. fig. 7.

Oppel (Juraf. p. 497) notes how Davidson's pl. xiii. 7 differs from his *T. Fleischeri*. The other figure cannot represent one of Oppel's types, for he does not mention Cheltenham in his list of localities, and *T. Fleischeri* belongs to the Cornbrash.

Common in the *Clypeus*-grit of the Cotteswolds.

T. birdlipensis, Walker, of which Dav. Suppl. pl. xvii. 18, may be taken as type, and *T. tumida*, Dav., mentioned in Suppl. p. 149 as *T. globata* var. *tumida*, are two more forms of what used to be called the *globata*-series. Presumably the specimens depicted in Ool. Brach. pl. xiii. figs. 5, 6, are what Davidson intended as *T. tumida*: Leckhampton and Cheltenham are really terms for the same locality.

* Proc. Cotteswold Club, xiii. p. 246 (1901).

XXXVII.—*On some Freshwater Amphipods: The Reduction of the Eye in a new Gammarid from Ireland.* By Prof. Dr. FR. VEJDOVSKÝ*.

[Plates XI. & XII.]

THE paper by W. F. de Vismes Kane (23) on the Amphipods of the Irish lake, Lough Mask, is worthy of attention in many ways. It records that the author collected there about 130 specimens of *Niphargus Kochianus*, among which there were three "which had well-developed pigmentation and a fourth which showed a cloudy shading in the optic region." As I had already stated (22) that in "*N. Kochianus*" rudiments of eyes without pigment are present, I was obliged to devote special attention to the work of de Vismes Kane, according to which pigment was still actually to be found in certain individuals.

Mr. de Vismes Kane, with the greatest kindness, placed at my disposal, for purposes of investigation, a portion of his collection of the above-mentioned Gammarids from Lough Mask, including examples of the wholly blind *Niphargus* and also the four individuals with the eye-flecks which had been preserved in formol. This valuable material, for which I here wish to thank Mr. de Vismes Kane, proved to be of great importance for several reasons, viz.:—

(1) Because it furnishes evidence as to the extent of the first stage in the reduction of the compound eye;

(2) Because by reason of this degeneration it is possible to explain the significance of the "pigment-veil" [Pigment-schleier] already known in *Crangonyx subterraneus*; and

(3) Because, lastly, it offers the possibility of deciding the relationship of the freshwater shrimp [Flohkrebs] found in the wells of Munich, usually alluded to as *Niphargus "Kochianus,"* with the similarly designated species from England and Ireland.

I. ON BATHYONYX, gen. nov.

In his paper de Vismes Kane refers all the Gammarids found in Lough Mask to a single species, viz., *Niphargus Kochianus*, Bate. I have been able to confirm this identification with the exception of those four individuals with eye-

* Translated by D. J. Scourfield from the 'Sitzungsberichte der königlichen böhmischen Gesellschaft der Wissenschaften,' No. 28, Prag, 1905.

pigment, which in no way possess the characters of the genus *Niphargus*, but are representatives of a new genus intermediate between *Crangonyx* and *Gammarus*, which I designate *Bathyonyx*. To the species I give the name of *B. de Vismesi*, gen. nov., sp. n., in honour of the discoverer.

Generic and specific characters:—*Bathyonyx* with both pairs of antennæ very short (the flagellum of the first usually 6-jointed, that of the second 4-jointed), with 2-jointed secondary branch on the first antennæ. Eyes consisting of crystalline cones diffusely distributed in the pigment. Gnathopoda with weakly developed hands; the hands of the anterior gnathopods broader than those of the second pair. Telson split for two-thirds of its length, consequently bilobed. Third pair of uropods with an outer 2-jointed, and a short inner 1-jointed branch, scantily furnished with setæ, as in *Crangonyx*. Segmental capsular epidermal sensory organs fusiform.

Bathyonyx de Vismesi, gen. et sp. nn.

The four specimens examined were all of equal length, namely 3 mm., and of similar form. Being preserved in formol they still showed traces of the original pale orange-red coloration which was especially noticed by de Vismes Kane in the living condition.

The antennæ are remarkably short, attaining about one-fourth of the body-length; there is no well-marked distinction between the joints of the peduncle and the flagellum, for the three basal joints pass gradually into those of the flagellum. In this way the total number of joints of the first antennæ amounts to nine in two specimens and eight in the third. (The fourth example was cut into serial sections.) The third joint carries the 2-jointed secondary branch, of the same form as in *Niphargus* for example, *i. e.* with an elongated and greatly swollen basal joint, and a short and slender distal joint (Pl. XI. fig. 2, *n*). The antennal setæ are weak, short, and scanty, from 1–4 on each joint as in *Niphargus*. The sensory setæ, which I have described from the antennæ of *Crangonyx* as sensory brushes [Sinnespinsel], are also present in *Bathyonyx*, but they are very feebly developed, so that they can be easily overlooked.

These remarkable sense-hairs are characteristic not only of these genera, but also of *Niphargus* and *Gammarus* (especially those of the first joint of the first antennæ), occurring, in fact, in the last-named genus in the greatest number.

Thus in *G. fluviatilis* from Herzegovina (collected by Dr. Thon) I invariably found seven sensory brushes on the

distal outer edge of the first joint in the space between the large ordinary setæ. In addition, there are in the middle of the same joint two further sensory brushes, accompanied by a thicker ordinary seta, exactly as in *Crangonyx*.

In *Bathynonyx* also there are always two sensory brushes in the middle of the first joint and four on the distal edge. Their structure is the same as in *Crangonyx*, *Niphargus*, and *Gammarus*. Each sensory brush consists of a basal cup or urn sunk into the fibrous inner cuticle. (This fibrous inner cuticle is covered with a thin homogeneous outer cuticle, Pl. XI. fig. 14, c).

From the cup there arises the stem of the seta, which, at its distal end, is furnished with two lateral rows of fine hairs (Pl. XI. fig. 14). I have designated these sense-hairs in *Crangonyx* as "quaking-hairs" [Zitterhaare], because in the living state they are found to be subject to periodical vibratory movements, which points to some definite sensory action. The quaking movement of these hairs of Amphipods is certainly worthy of remark, especially as it resembles ciliary action, although produced in a different manner from the latter. The quaking of the sense-hairs reminds one rather of the flame-cells [Zitterorgane] of the Rotatoria, or of the tufted hairs [Büschelhaare] which I have described in *Bothrioplana bohémica* *.

By the examination in profile of the transparent first antenna it is easy to demonstrate that the sensory brushes are supplied with nerves from the antennal ganglion. Long and fine processes from the ganglion-cells are connected with special club-shaped cells, the short process from each of which is spread out like a dish at the base of the cup from which the seta arises (Pl. XI. fig. 14, ne). The structure of the ganglia in the antennæ of the Gammarids is, according to what I have so far been able to demonstrate in *Gammarus pulex*, &c., very characteristic and deserves special attention from comparative nerve histologists.

On the lower antennæ the sensory brushes only occur singly; thus I have observed two on the second joint and one each on the third and last joints of the same form and size as on the first antennæ.

I only found the hyaline clubs, so-called olfactory clubs, on one specimen (Pl. XI. fig. 3); they are very short, not attaining the length of the joints, and therefore very difficult to observe.

* "Zur vergleich. Anatomie der Turbellarien," Zeit. f. wiss. Zool. Bd. lx. (1905).

Sensory brushes are present on the telson * as well as on the antennæ, as has already been shown in many Amphipods. Their position upon the surface of the telson appears to be characteristic of the species of *Niphargus* and *Gammarus*. In *Bathynyx* the telson is split for two-thirds of its length, thus being bilobed posteriorly, the lobes gradually narrowing and each being furnished at the point with a long and a short simple seta (Pl. XI. fig. 13).

In addition there is always present here a short sensory brush. Somewhat anterior to this group of hairs and towards the exterior edge there are always two longer sensory brushes of the same form and size as on the antennæ. The innervation of all the sensory brushes on the telson evidently proceeds from the lateral nerves of the last ventral nerve-cord ganglion, as I have been able to demonstrate, for example, on the telson of the New Zealand species *Crangonyx compactus*, Chilton.

Quite different in structure from the sensory brushes are the segmental sensory capsules, which, among different Gammarids, exhibit a form typical for the genus. By means of these sense-organs the genera *Niphargus*, *Crangonyx*, and *Gammarus* can be determined with perfect safety. But they are somewhat difficult to find, especially when only a few occur on the segment, as they are characterized by their extremely minute dimensions. It is only on this account that I have not made an earlier reference to their occurrence in *Crangonyx*. I refer to the capsules as segmental sense-organs because they are distributed partly on the body-segments and partly on the epimera. The form, number, and distribution of the capsules can be seen without much difficulty in preparations of the second epimera, where they appear regularly disposed in a semicircle on the margin, and, in consequence of the sharply contoured cuticular walls, they stand out as plainly in the living animal as in preparations. The sense-hairs, too, which are connected with the capsules, make the recognition of the latter easier.

Among the species of the genera already mentioned I have made out the following forms of sensory capsules:—

In *Niphargus* they are mostly flask-shaped, gradually narrowing towards the exterior, where they pass into the little sense-hair. The sense-hairs are mostly plumose, or like a paint-brush, rarely simple and pointed.

I have examined the sensory capsules of various species of

* Chilton has also observed them on the penultimate joint of the fourth pereopods in *Gammarus fragilis*.

Niphargus as regards shape and have been able to determine the following forms:—

Niphargus puteanus from Prague (Pl. XII. figs. 23 & 24). Sensory capsules $12\ \mu$ long and $4\ \mu$ broad, with usually a short sense-hair ending in a tuft. Less frequently the sense-hairs are simple, not branched.

Niphargus elegans from Modena (Pl. XII. fig. 22). Sensory capsules of the same form as in *N. puteanus* from Prague, but the sense-hairs have forked ends with a long tuft on one side.

Niphargus tatrensis (Switzerland, fig. 26), more strongly swollen, with a simple sense-hair ending in a thread.

A *Niphargus* from Lille has very small sensory capsules with sense-hairs of the paint-brush type (fig. 27).

In *Niphargus Caspary*, from Munich, the sensory capsules are very pale, thin-walled, and short. They give rise to a simple short sense-hair (fig. 28).

Niphargus Kochianus (Lough Mask in Ireland) is provided with nearly spherical sensory capsules narrowed towards the exterior and tufted sense-hairs (fig. 29).

In *Crangonyx subterraneus*, great numbers of which I have been able to examine recently from the point of view of the sense-organs now in question, the capsules are almost cylindrical, longer than broad, the sense-hairs long, not plumose; sensory capsules $4\text{--}5\ \mu$ long, sense-hairs $20\ \mu$ long (fig. 30).

In *Crangonyx compactus*, from New Zealand, the sensory capsules are very slender, terminating with a simple hair (fig. 25).

In all the species of *Gammarus* the capsules are, in the main, spindle-shaped, slender, pointed exteriorly, not infrequently constricted in the middle, the sense-hairs short, not plumose. The length of the capsules varies, according to the species, from $16\text{--}22\ \mu$ (figs. 20 & 21). The same details of the form of the capsules apply, in general, to *Bathynonyx* also, but the structures are much smaller and difficult to find (figs. 17, 18, *spo*, *spo'*).

The internal structure of the sensory capsules differs from that of the sensory brushes, but is the same in all genera, as can be demonstrated with the greatest precision on the larger forms occurring in the Gammarids. The proximal portion of the cuticular wall of the capsule turns inwards and forms a hollow axial stalk, to which the sensory seta is attached. In some species of *Gammarus* and in *Crangonyx* the distal end of the stalk, *i. e.* where the sensory seta arises, is thickened into a little head. It is not difficult to make out that the

capsules are innervated from the cutaneous nerves, for a pale but sharply contoured nerve-thread approaches the base of each capsule and then clearly passes along the stalk to be joined to the sensory seta. The nerve-fibre always originates from one ganglion-cell, as is accurately shown by Hamann.

The sensory capsules are found on all the segments. On the cephalic segment of *Bathynonyx*, close behind the diffuse eye, there are 4-5 capsules arranged in a curved line (fig. 17, *spo*), and not far behind there is a second row of 3-4 capsules (fig. 17, *spo'*). On the following segments the number may be less, but they occur more or less regularly also on the hinder segments.

In *Crangonyx* I always found, in the hinder region of the body, four capsules on each segment, two anterior and two posterior, while on the anterior segments they were rarer and less regularly distributed, although one must take into account the circumstance that the structures can easily escape observation by reason of their minuteness and their usually small refractive power.

The attention of earlier investigators was very often given to the sensory capsules. Thus La Valette observed them on the back and therefore referred to them as "capilli in corporis dorso siti." Humbert recognized them as sense-organs and designated them accurately as "capsules sensitives." As Hamann justly remarks, Leydig combatted the correctness of this expression, "for it is not a question of capsules but of modified cuticular canals. But from his description it is evident that he classed these organs with the similarly formed hair-structures of the antennæ and only examined the latter." Vom Rath and more recently Hamann have correctly described and figured the sensory capsules (referred to by Hamann as sensory clubs). Della Valle calls the organs "peli," but his figures are reproduced on a small scale, so that the structure of the capsules, nerve-endings, and sensory setæ do not clearly appear.

The most remarkable organs of *Bathynonyx* are undoubtedly the EYES, and for this reason I propose to describe them in detail. Not one of the four above-mentioned specimens has normal compound eyes such as are found in *Gammarus*, but visual organs with scattered components on both sides of the head. Unfortunately, owing to the fixing agent, the pigment was not perfectly preserved, so that it is impossible to state exactly the number of the pigment-cells.

One example was cut into a complete set of serial sections, principally with the object of showing more precisely the relation of the nerves and optic ganglia to the external visual

apparatus. Unfortunately the preservation in formalin had so much damaged the internal nervous structure and the brain that nothing definite can be said in this connection. It is only possible to refer to the superficial appearance of the eye, and in addition at most to the position of the dioptric elements under the hypodermis as observed in preparations of the entire animals under moderate and high-power magnification. But even in this way interesting results are obtained.

In general the eye of *Bathynonyx* is not a compact organ, such as we are accustomed to picture the compound eye of Arthropods, but forms a large irregularly defined flock of unequal size with a variable number of crystalline cones in each of the available specimens. I figure such eyes in figs. 16-18.

In fig. 16, which is drawn under a low magnification, there are twenty-four cones. They occur in a dark (brown to brownish black) fine-grained pigment which appears to be most thickly developed in the centre of the eye.

Here was evidently situated the original eye, as, for example, in *Gammarus*. In this central pigment most of the crystalline cones are collected, without, however, forming a compact organ.

They are as irregularly distributed in the pigment, without any definite position, as the peripheral crystalline cones, which mostly lie under the ordinary hypodermis without any pigment. All the crystalline cones are commonly composed of two segments or simply constricted, the hemispheres being sometimes equal and sometimes unequal in size. Now and again at the periphery small wholly isolated cones are also found. The crystalline cones consist of a strongly refractive homogeneous brownish substance, and therefore stand out clearly in the preparations.

In this condition the individual cones appeared in all four specimens. Another eye, as seen under strong magnification (as with Hom. Imm. Apochr. Obj. 2 mm., Oc. 4) and showing interesting details in the structure of the cones, is reproduced in fig. 17.

Here the scattered components of the eye are still more striking; in the centre of the eye-fleck one finds large, simple, rarely double, hexagonal or irregularly branched pigment-cells in the midst of whose granular substance a small rounded nucleus can be detected (*p*). The whole system formed by the cones and the central pigment-cells retains in the main a reniform shape, as is also typical of the compound eyes of *Gammarus*. In *Bathynonyx*, however, there exists no

connection between the individual cones; they are isolated and mostly situated at the periphery of the pigment-cells. The total number of the cones in the specimen represented amounts to only fourteen, and the variable form and size of the components can be well seen in the drawing.

The number, form, and size of the crystalline cones vary, however, not only in different individuals, but also in the right and left eyes of one and the same animal. The eye just described belongs to the left side of the head (fig. 17). In fig. 18 is shown the eye from the right side of the same animal. In the centre of the pigment-cells there is only one crystalline cone; the others are situated at the periphery of the pigment-cells, irregularly scattered, and two even lying not far from the frontal margin of the head. In this case there are only eleven crystalline cones of the most diverse size and form.

The structure of the crystalline cones here reproduced is certainly very peculiar and difficult to correlate with the details of an ordinary compound eye of *Gammarus*. In each cone there is a dark, finely granular, sharply defined matrix, at whose margin, when in a favourable position, a little body can be seen which I am inclined to consider as a nucleus. In this matrix an irregular number of smaller rounded bodies are present. In the simplest case there is a large central sphere and with it one or more little spheres. There can, however, be such an increase of both kinds that the matrix appears to be filled with vacuoles. These inner vacuolar spherical bodies are filled with a homogeneous slightly refractive substance which is only stained by carmine in a very feeble and diffuse way.

In the above-mentioned serial sections into which one specimen was cut, I have unfortunately found little explaining the connection of the appearance in side view of the crystalline cones, as described, with the nervous organization. In fig. 19 one such section is reproduced. Nothing is here to be seen of the nerves. The cuticle of the head (*c*) stands off a long way from the eye. The hypodermis (*hp*) forms a thin layer which contains only the regularly placed nuclei. Underneath there are three groups of large pigment-masses without nuclei, between which occur rounded vacuolar bodies. These are the rudiments of the crystalline cones, and they are not nearly so refractive in these sections of 5μ in thickness as in the preparations showing the animals from the side. A direct connection between the outer larger pigment-masses and the deeper layer of smaller pigment-cells (*rt*) does not exist in the serial sections.

Between the two layers there is a hollow space, whether artificially produced or not I am unable to decide. But according to the known structure of the eye in *Gammarus* we should be dealing, in the lower pigmented layer of cells arranged almost like epithelium, with retinula-cells, to which also the outer pigment-masses belong, they being certainly only separated by the unsatisfactory method of fixing. From this it would seem that in *Bathynyx* the retinula apparatus was still retained, although the dioptric elements were gradually destroyed. For the crystalline cones described above must be considered as being in process of degeneration: firstly, because they do not form a single compact eye, but are only loosely scattered under the hypodermis, and, secondly, because the actual substance of the normal crystalline cone is gradually degenerating.

Special investigation of the mouth-organs of *Bathynyx* shows that they resemble in form those of *Crangonyx*, except that they are much more feebly developed, thus corresponding to the general organization of *Bathynyx*. The drawings of the mandibles and their palps (fig. 4), of the maxillæ of the first (figs. 5 & 6) and second pairs (fig. 7), and, lastly, of the maxillipedes (fig. 8) entirely support this conception. The palpi of the maxillipedes are almost as long as the gnathopods, which are also very weakly developed, especially the hands, which, under low magnification, can scarcely be distinguished from the almost equally broad or even broader proximal joints (carpopodites). The form of the hands of the gnathopods of both pairs reminds one of *Crangonyx*, but in general in this case, as in *Crangonyx*, there is some variability. In order to show this I give in figs. 9-11 camera drawings of the hands of three specimens. Figures 10 and 11 are shown under the same and fig. 9 under a slightly higher magnification. From a comparison of the three it is apparent that the only character common to all is that the hands of the first pair are obviously broader and shorter than those of the second pair. It can also be seen from the drawings that the oblique outer edge of both hands is finely toothed and that the armature of strong setæ which is characteristic of the hands of *Gammarus*, *Crangonyx*, and in part *Niphargus* (as I have specially remarked in connection with *Crangonyx*) is entirely absent in *Bathynyx*. In other respects a slight variability in the form of the hands is to be observed in all three cases, which is also true of *Crangonyx*. A comparison of the form of the gnathopod hands of the last-named genus, as I have figured them in my paper (21, figs. 12-14), with those figured

by Chilton (7, fig. 4, *gn*, *gn*²) might easily lead to the view that the *Crangonyx* found in Bohemia in a certain measure represented a different species to that found in English wells. Indeed Stebbing, on the ground of my representation and his own experience, has considered that the *Crangonyx* found at Radetin near Prague belongs to a distinct genus and species "*Eucrangonyx Vejdvskyi*." Only after comparison of the original specimens from Bohemia and England, which we made in Prague with Chilton, was it demonstrated, beyond all doubt, that we were dealing with one and the same species, in which the form of the gnathopod hands in different individuals is subject to a noticeable variability.

I have been able recently to convince myself that this is actually the case by an examination of numerous specimens of *Crangonyx* which were collected in the course of last year in great quantities in wells at Podbaba, near Prague, by my energetic pupil Herr Niessner.

I have not specially investigated the other feet, as, in the main, they resemble in form the corresponding extremities of *Crangonyx*. The little double hooks on the thighs of the first and second pleopods also differ only in a small degree from the same structures in other Gammarids, especially *Gammarus* (fig. 15). Further, the last pair of uropods correspond with those of *Crangonyx*; they are rather short, the basal joint almost as high as broad; the outer branch consists of a long proximal and a short thin distal joint (fig. 12).

The proximal joint bears on its side only one or two setæ, and differs essentially in this respect from the corresponding joint of the *Niphargi* and Gammarids, which is armed with tufts of strong setæ.

The inner branch is 1-jointed and reaches more than half the length of the outer branch. Moreover, it is comparatively longer than in *Niphargus* and shorter than in *Gammarus*. I must, however, remark that I have only examined these uropods in two specimens.

From the point of view of general biology the discovery of *Bathynonyx* is very important. So far as its systematic position is concerned, the genus comes between *Gammarus* and *Crangonyx*, as it agrees with the former in its capsular segmental sense-organs and with the latter in the rest of its organization. Only the absence of the so-called secondary gills, which are so characteristic of *Crangonyx* (and *Boruta*), and the two-lobed telson separate *Bathynonyx* from the genera

mentioned and bring it in some respects near to *Gammarus* and in others to *Niphargus*.

According to de Visines Kane, *Bathynonyx* was obtained from a depth of from 130 to 150 feet in Lough Mask. From the general habitus of its body and most of the details of its organization it may be regarded as a degenerate form, a conception which is strongly supported by the sense-organs, especially the eyes. All the above-mentioned cuticular sense-organs, as the sensory brushes and capsules, are present in all species of *Gammarus* living in ordinary fresh waters, but in much greater number and development than in *Bathynonyx*, where they are subject in both directions to a reduction corresponding to that of the eyes, and cannot therefore be considered as compensatory organs. The ancestors of *Bathynonyx* evidently possessed the same sense-organs as, for example, the common *Gammarus*, and in the same number and development, but they degenerated in the course of time in the depths of Lough Mask. There is no reason for supposing that these crustaceans reached the lake in the water from the springs; their organization strengthens us rather in the opinion that the progenitors are to be sought perhaps only in a species of *Crangonyx* or *Gammarus* which gradually adapted themselves to life at the bottom of Lough Mask. Although species of *Crangonyx* possessing eyes are known, among which especially *C. recurvus*, according to Grube, lives in Lake Vrana, on the island of Cherso, unfortunately its organization has not been hitherto carefully studied*. From what has been said it appears that we must attach the greatest importance to the eyes.

The gradual adaptation to life in the darkness of deep lakes and subterranean waters generally produces the result that the organs of sight are gradually, not suddenly, reduced, until at length the animal appears quite eyeless, and transmits its blindness to the following generations. So far as the freshwater Amphipoda are concerned, we now know a series of cases in which we must conclude that eyes were formerly present. Reference has often been made to the observation of Leydig that certain individuals of *Niphargus puteanus* were provided with eye-pigment just in that part of the head where the eyes are situated in such a form as the common *Gammarus*.

* From an interesting paper by M. Grochowski (11) I learn that he and Professor B. Dybowski found in 1895 a large number of *C. recurvus* in the lake mentioned. A special account of this species therefore may be expected.

Although in the course of thirty years I have investigated from this point of view hundreds of examples of the species mentioned, I have not been able to find anything of the pigment in question in a single individual, and I believe therefore that we are driven to the conclusion that Leydig only had *Orangonyx* before him. In this genus I have invariably found, not only in examples from Radotin, near Prague, but also recently among great numbers of individuals from the wells of Podbaba, near Prague, pigment-flecks on both sides of the head, consisting of large branched cells such as I have described in an earlier paper.

Very interesting is the further statement of Moniez (14), from which it appears that he observed a "*Gammarus fluviatilis*" in the drinking-water of Emmerin, near Lille, whose eyes appeared in the form of dark flecks.

They were not so compact as in the normal freshwater shrimps, but appeared to consist of single ommatidia surrounded by black pigment, and the crystalline cones were not so round as in the typical species. Moniez therefore described the form he had observed as *G. fluviatilis*, var. *d'Emmerin*. According to the description we should have here a case of rudimentary eyes exactly corresponding to what we have specially described in *Bathynonyx*, and it is to be hoped that the Emmerin variety may be subjected to an examination as to its other characters in order to see whether it may not represent a distinct species closely allied to *Bathynonyx de Vismesi*.

Not less important is the communication of R. Schneider (19) about the *Gammarus pulex* living in the underground waters of Claustal, in which the author found the eyes to be in a peculiar condition. They are of irregular form, without definite outline, with a little blackish pigment which is confined to the centre of the eye, disappearing towards the periphery. The crystalline cones are separated from one another, and the eye is therefore diffusely formed as in our *Bathynonyx*. R. Schneider designates the form as *G. pulex*, var. *subterraneus**.

According to Garbini, the *G. fluviatilis* observed by him near Verona exhibits the same arrangement with regard to the eyes as Schneider's *G. pulex*, and he calls the form *G. fluviatilis*, var. *monophthalmus*. The same author mentions also *N. elegans*, var. *imperfectus*, with small brownish pigment-

* [The original description by Schneider is given by Prof. Vejdvský in a long footnote, but it has not been thought necessary to reproduce it in this translation.—Translator's note.]

flecks, like those I have referred to in connexion with the specimens from Modena.

The large pigment-flecks of *Crangonyx subterraneus*, which I have described as a pigment-veil ["Pigmentschleier"], suggest by their position the former presence of eyes; I have not, however, referred to them as rudiments of eyes so long as there was no definite proof that the pigment was directly connected on the one hand with the crystalline cones and on the other with the optic ganglia.

We know now, however, that on the one side there are species of *Crangonyx* with normal eyes, and on the other that the eyes of *C. compactus* from New Zealand are, according to Chilton, only represented by two or three little "lenses" without pigment. If we turn to *C. subterraneus*, we must regard the pigment-veil as a rudiment of an eye in which the crystalline cones have completely disappeared and only the pigment-cells remain. We find, therefore, that the genus *Crangonyx* is characterized by visual organs in all possible stages of reduction; and we might expect to find similar series of degenerating eyes in other genera. For *Gammarus* I have already mentioned the observations of Moniez and Schneider; a completely eyeless species *G. fragilis*, has been described from New Zealand by Chilton, and I myself know a large species from Herzegovina the two examples of which in my possession lack all trace of eyes.

The same series may be made out in *Niphargus*. It is true that species with normal eyes are not known, but *N. elegans*, which is characterized by possessing only the eye-pigment, permits of the assumption that there are species with eyes, and there exists a whole series of completely blind species, as *N. Kochianus*, *Caspary*, *puteanus*, &c. (The work of Viré has not been accessible to me.)

Now it is possible that there are eyeless forms which occur at the same time and in the same place with those possessing reduced and normal eyes. At least "*Gammarus pulex*," from Wüdenschwyl in Switzerland, deserves a renewed investigation, as, according to the statement of Asper, it is represented at a depth of 40 m. by individuals with and without eyes. This case of variable development of the visual organs in different individuals of the same species is confirmed among other species of animals by Packard, and Forel particularly notes that in rare and exceptional instances the blind *Asellus Forelii*, Blanc, still bears vestiges of eyes; and in this connexion it may be remembered that years ago I found in a well in Prague both eyed and eyeless forms of the rhabdocœl *Gyrator notops*, Dugès. The eyeless form

has been described by L. v. Graff as a distinct species—*Gyrator coccus*.

The foregoing cases may support the opinion expressed by Packard, and more recently by Chilton, that it is possible that different species, and even individuals from different localities, may exhibit different stages in the reduction of the eyes.

The discovery of *Bathynonyx* offers now excellent evidence as to the probable first stage in the degeneration of the eyes. The ancestors of this genus were certainly closely related to a *Gammarus* with normal eyes, as may be seen from the whole organization and in particular from the capsular segmental cuticular sense-organs. The visual organs also represent the well-known kidney-shaped eyes of a *Gammarus*-like ancestor. The descendants, adapting themselves to live in the dark depths of the lake*, gradually lost the power of seeing with the compound eye, as individual ommatidia remained functionless and consequently the crystalline cones became subject to degeneration. Only the pigment-cells remained and the ommatidia which still retained their functional power appeared then as scattered components of an eye on each side of the head. It is in this stage that *Bathynonyx* now presents itself to us.

But the crystalline cones still present have also undergone degeneration, as is shown by the little homogeneous spheres within the cones. The hypothesis of the progressive reduction of the eyes can, I believe, be supported by the following facts:—

(1) From the variable number of the crystalline cones in one and the same animal on the right and left sides of the head.

(2) From the extremely variable size of the individual crystalline cones, which in one and the same eye present instances of diminution in size so as to finally appear simply as little refractive particles.

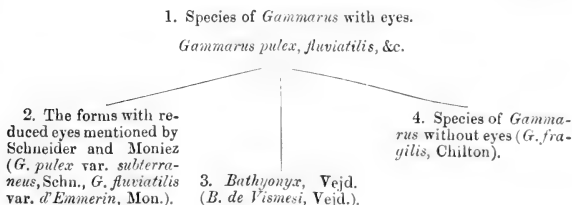
(3) From the form of the crystalline cones themselves. The homogeneous spheres within the fine-grained matrix must, I think, be regarded as evidence of degeneration. In this way the crystalline cones lose their dioptric property. The degeneration, however, does not occur in any particular order, but may affect widely separated ommatidia, while the intermediate cones may remain intact.

In consequence of the foregoing, the originally compact

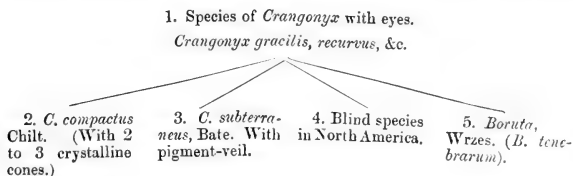
* From the small number of specimens obtained it may be supposed that the species lives perhaps in the mud and only occasionally swims about freely in the water.

eye breaks up into a variable number of scattered elements which occupy a considerable space without any definite arrangement.

From what has been said it appears that we must consider the structure of the eyes in *Bathynonyx* as representing the first stage of degeneration, and therefore this genus as the first which could arise from the *Gammarus*-like ancestor with normal eyes. The ancestry of the blind species of *Gammarus* and of *Bathynonyx* may be represented as follows:—

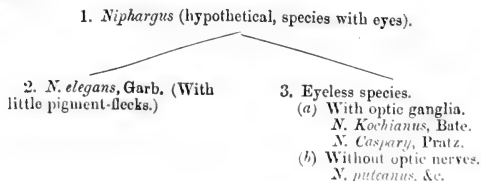


An exactly similar series can be made out in *Crangonyx*, and adopting the same method as above the following result is obtained:—



For *Niphargus* also a corresponding series of species can, in all probability, be drawn up in spite of the fact that no species bearing eyes are yet known. That such must have existed, however, is proved by the species with rudimentary visual organs.

The series in this case may be shown in the following manner:—



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EXPLANATION OF THE PLATES.

General significance of the letters.

| | |
|--|---|
| <i>c.</i> Cuticle. | <i>n.</i> Secondary branch of the first antennæ. |
| <i>dh.</i> Ordinary setæ. | <i>p.</i> Pigment-cells. |
| <i>hk.</i> Hyaline spheres in the crystalline cones. | <i>r.</i> Retinula-cells. |
| <i>hp.</i> Hypodermis. | <i>sp.</i> Sensory brushes. |
| <i>kr.</i> Crystalline cones. | <i>spo, spo'.</i> Segmental cuticular sense-organs. |

PLATE XI.

- Fig.* 1. *Bathynonyx de Vismesi* under low magnification. The appendages of the left side only are shown.
Fig. 2. Portion of the third joint of the upper (first) antennæ, with the accessory branch (*n*).
Fig. 3. Terminal portion of the antenna, with two hyaline clubs [so-called olfactory clubs] and a sensory brush.
Fig. 4. Mandible, left side, from below.
Fig. 5. Maxilla of first pair; the inner lobe is not visible in this position.
Fig. 6. *a*, inner, *b*, outer teeth of the middle lobe of maxilla of first pair.
Fig. 7. Maxilla of the second pair.
Fig. 8. Maxillipede of the left side.
Figs. 9-11. Gnathopods of the first (*a*) and second (*b*) pairs of three individuals under nearly equal magnification, in order to show the moderate variability of their form.
Fig. 12. Uropod of the third pair.
Fig. 13. Telson from above, in order to show the position of the sensory brushes.
Fig. 14. Outer (*c*) and fibrous (*c'*) cuticle, in which the urn of a sensory brush is embedded. *ne*, nerve-ending.
Fig. 15. Double hooks of the first and second pleopods.

PLATE XII.

- Fig.* 16. Distribution of the crystalline cones in the pigment and on its periphery under low magnification. *Bathynonyx*.
Fig. 17. Head from the left side, with basal joints of the first and second antennæ, the diffuse eye, and the segmental cuticular sense-organs. Highly magnified.
Fig. 18. Head of the same animal seen from the right side, in order to show the variable number of crystalline cones.

Fig. 19. Section through the diffuse eye of a specimen preserved in formol. The cuticle (*c*) is widely separated from the hypodermis (*hp*). *rt*, retinula.

Figs. 20-30. Segmental sensory capsules of different representatives of the genera *Gammarus*, *Niphargus*, and *Crangonyx*.

Fig. 20. *Gammarus* sp., from Herzegovina (22 μ long).

Fig. 21 *a*, *b*. *Gammarus* from Lautenthal (16 μ).

Fig. 22. *Niphargus elegans* from Modena.

Figs. 23, 24. *Niphargus puteanus* from Prague (12 μ).

Fig. 25. *Crangonyx compactus*.

Fig. 26. *Niphargus tatrensis* (Switzerland).

Fig. 27. *Niphargus* from Lille.

Fig. 28. *Niphargus Caspary* from Munich.

Fig. 29. *Niphargus Kochianus* from Lough Mask; *b*, in optical section.

Fig. 30. *Crangonyx subterraneus* from Podbaba, near Prague.

[The foregoing paper by Prof. Vějdovský, of Prague, has been translated by my friend Mr. D. J. Scourfield, and would have appeared in print last year, but that it seemed desirable if possible to supplement the information by the result of further researches. Unfortunately three days' dredging undertaken last summer, and again this year, failed in securing any additional specimens of *Bathynonyx de Visnesi*, although 251 examples of *Niphargus Kochianus*, Bate, were taken in Lough Mask. The bright orange colour which characterizes them all, as well as *Bathynonyx*, from the lake, finds a parallel in the observation of M. Chevreux referring to *Niphargus Plateaui*, var. *robustus*, captured in an open basin formed by the source of the Robine at the foot of the mountains of Gardiole, the adult specimens of which he described to be of a salmon-red, paler in the younger individuals. The probability that these animals might have been originally introduced from the underground streams that percolate the limestone strata about Lough Mask suggested an investigation of these latter. Accordingly, Lord Ardilaun's permission having been given, a research was conducted into the subterranean waters in his extensive grounds near Cong. This resulted in the discovery of thirteen *N. Kochianus* in one cave and a single specimen in another. All fourteen were of the usual translucent hue which I am accustomed to see in examples of *Niphargus* taken from wells, but, with the exception of their colour, were in every respect identical with those of the lake. Hence it is now scarcely open to doubt that the blind species of *Niphargus* recorded as occurring in Lough Mask, the Lake of Geneva, the Lake of Zirknitz in Carniola, and some Swiss lakes, have been derived from their congeners inhabiting subterranean waters, and that the orange or salmon-red colour of those in Lough Mask and those cited

by M. Chevreux is an attribute of the changed environment. I do not know whether a similar colour characterizes those of other open waters. As to the origin of *Bathyonyx*, however, we have so far no indication of its derivation from subterranean ancestors; and it appears probable, according to Prof. Vejdoský, whose judgment is based upon its general characteristics and the details of its organization, that its progenitors lived in the open waters of Lough Mask and that its present characters are the result of its existence in the lowest depths. My latest researches have also strengthened the probability of his suggestion that a habit of burrowing in mud may have enabled *Bathyonyx* to escape capture by the dredge, which skims the surface of the lake-floor. Nevertheless a considerable amount of mud was subjected to examination on each occasion, which produced nothing but some *N. Kochianus*.

The latter portion of Prof. Vejdoský's paper on the synonymy of

Gammarus Caspary, Pratz,
Gammarus Kochianus, de Rougemont,
Niphargus Kochianus, Vejdoský,
Niphargus Caspary, Wrześniowski,
Niphargus Kochianus, Chilton,

has been omitted.—WM. F. DE VISMES KANE.]

XXXVIII.—*Observations on the Trematode Parasites of British Birds.* By WILLIAM NICOLL, M.A., B.Sc., Gatty Marine Laboratory, St. Andrews.

TOWARDS the end of last spring I had an opportunity of examining several of the commoner species of shore-birds. These were, unfortunately, in most cases not in the best condition for helminthological investigation, as I seldom received them till at least a day after they were killed, when the parasites were almost always dead. The immediate application of weak formalin, however, preserved their anatomical details rather well, although it rendered them unfit for histological work. For this reason important features in some cases are only superficially described, a matter which I hope to improve shortly with the help of better material. These observations are thus to be regarded, to a certain extent at least, as merely preliminary.

The species obtained appeared on a first examination to be all assignable to well-known genera, e. g. *Psilostomum*, *Echinostomum*, *Gymnophallus*, *Tocotrema*, and in particular *Spelotrema*. The frequent occurrence of members of the last-named genus was not surprising, as I had previously found a *Spelotrema* species in great abundance in *Larus argentatus*. A great variety of sizes occurred, but in this respect there were no obvious lines of demarcation to indicate whether one or more species were under consideration. Closer examination proved that not only were there several different species, but that two distinct genera were present. They occurred, as a rule, side by side in the same hosts, occupying the same situations in the intestine and being equally numerous. I have been able to differentiate three distinct species of *Spelotrema*, as well as three species of the other genus, which is new and for which I propose the name *Maritrema*. In addition a new species of *Gymnophallus* and one of *Tocotrema* have to be recorded.

Altogether 16 species of birds were examined. Of these, three, *Urinator lumme*, *Alle alle*, and *Uria troile*, yielded no Trematode parasites. Of the other species 91 per cent. of the examples were more or less abundantly infected. Of the total number of all species 68 per cent. were infected. These figures are very high compared with those of Mühling*, Hausmann†, and Wolffhügel‡, but this is perhaps to be accounted for by the fact that I do not include any purely terrestrial birds (in the sense that they do not frequent the sea), which are apparently much less subject to infection than the shore-birds. Other possible explanations are that this locality is more favourable for infection, or that my examination has been more exhaustive than that of the above-mentioned observers.

The absence of Trematode parasites in *Alle alle* and *Uria troile* recalls a similar condition § in *Blennius pholis* amongst fishes. Both these birds are, so far as I know, purely aquatic and feed principally on crustaceans and fish. The shore-birds, on the other hand, live to a large extent on mollusks, as well as fish, the diet being thus in great part different. In the same way the diet of *Blennius pholis*, which subsists on small mollusks ||, differs from that of other

* Archiv f. Naturg. lxiv. p. 58.

† Centralbl. f. Bakter. xxvi. p. 452.

‡ Beitrag zur Kenntnis der Vogellhelminthen (Inaug.-Diss.), 1900.

§ Ann. & Mag. Nat. Hist. (9) xix. p. 68.

|| *Blennius pholis* is also fond of *Balanus*, but the sessile condition of the latter renders it different from other Crustacea.

fish, which feed largely on crustaceans, annelids, and each other. From these and other considerations it would appear that, in the littoral zone, at least, where both have a common feeding-ground, birds derive their Distomid parasites from mollusks*, while fish obtain theirs from crustaceans, annelids, and each other. This seems to afford an explanation of the absence of Distomids in the three above-cited cases.

For ease of reference I subjoin a list of hosts with their respective parasites:—

| | |
|---|---|
| <i>Alca torda</i> , Linn. Razorbill. | |
| <i>Tocotrema lingua</i> (<i>Crepl.</i>). | Intestine. |
| ? <i>Spelotrema simile</i> , <i>Jägersk.</i> (juven.). | Intestine. |
| <i>Larus argentatus</i> , Brünn. Herring-Gull. | |
| <i>Gymnophallus deliciosus</i> (<i>Olsson</i>). | Gall-bladder. |
| <i>Maritrema lepidum</i> , sp. n. | Intestine. |
| <i>Parorchis acanthus</i> , <i>Nicoll</i> . | Bursa Fabricii, rectum, and intestine. |
| <i>Spelotrema excellens</i> , sp. n. | Intestine and cæca. |
| (= <i>Sp. simile</i> , <i>Jägersk.</i> , <i>Nicoll.</i>) | |
| <i>Tocotrema lingua</i> (<i>Crepl.</i>). | Intestine. |
| <i>Monostomum</i> sp. (juven.). | Intestine. |
| <i>Larus canus</i> , Linn. Common Gull. | |
| <i>Parorchis acanthus</i> , <i>Nicoll</i> . | Rectum. |
| <i>Larus ridibundus</i> , Linn. Black-headed Gull. | |
| <i>Maritrema gratiosum</i> , sp. n. | Intestine. |
| <i>Phalacrocorax graculus</i> (<i>Meyer</i>). Shag. | |
| ? <i>Cryptocotyle concavum</i> (<i>Crepl.</i>). | Intestine, cæca, and rectum. |
| <i>Oidemia nigra</i> (Linn.). Scoter. | |
| <i>Gymnophallus dapsilis</i> , sp. n. | Bursa Fabricii. |
| <i>Psilostomum brevicolle</i> (<i>Crepl.</i>). | Intestine. |
| <i>Spelotrema pygmæum</i> (<i>Levins.</i>). | Intestine. |
| <i>Oidemia fusca</i> (Linn.). Velvet Scoter. | |
| <i>Gymnophallus dapsilis</i> , sp. n. | Bursa Fabricii (and ? cæca). |
| <i>Psilostomum brevicolle</i> (<i>Crepl.</i>). | Intestine, cæca, and rectum. |
| <i>Spelotrema pygmæum</i> (<i>Levins.</i>). | Intestine, cæca, and rectum. |
| <i>Monostomum</i> sp. | Cæca. |
| <i>Pelidna</i> (<i>Tringa</i>) <i>alpina</i> (Linn.). Dunlin. | |
| <i>Maritrema gratiosum</i> , sp. n. | Intestine. |
| <i>Spelotrema feriatum</i> , sp. n. | Intestine, cæca, and rectum. |
| <i>Spelotrema claviforme</i> (<i>Brds.</i>). | Intestine, cæca, and rectum. |
| <i>Totanus calidris</i> , Bechst. Redshank. | |
| <i>Maritrema humile</i> , sp. n. | Intestine. |

* An important exception to this is the case of some *Spelotrema* species, which are obtained, partly at least, from *Cancer pagurus* and *Carcinus maenas*.

| | |
|---|------------------------------|
| <i>Spelotrema feriatum</i> , sp. n. | Intestine, cæca, and rectum. |
| <i>Tocotrema jejunum</i> , sp. n. | Intestine. |
| <i>Monostomum petasatum</i> , <i>Deslongch.</i> | Cæca. |
| <i>Numenius arquata</i> , Lath. Curlew. | |
| ? <i>Echinostomum secundum</i> , <i>Nicoll.</i> | Intestine, cæca, and rectum. |
| <i>Vanellus vanellus</i> (Linn.). Lapwing. | |
| <i>Spelotrema feriatum</i> , sp. n. (juven.). | Intestine, cæca, and rectum. |
| <i>Ægialitis hiaticula</i> (Linn.). Ring-Plover. | |
| <i>Maritrema graciosum</i> , sp. n. | Intestine and duodenum. |
| <i>Spelotrema feriatum</i> , sp. n. | Rectum, cæca, and intestine. |
| <i>Spelotrema claviforme</i> (<i>Brd.</i>). | Intestine, rectum, and cæca. |
| <i>Hæmatopus ostralegus</i> , Linn. Oyster-catcher. | |
| <i>Maritrema graciosum</i> , sp. n. (juven.). | Intestine. |
| <i>Spelotrema feriatum</i> , sp. n. (juven.). | Intestine. |
| <i>Psilostomum brevicolle</i> (<i>Crepl.</i>). | Intestine and cæca. |

Genus SPELOTREMA, Jägerskiöld.

Spelotrema excellens, sp. n.

= *Sp. simile*, Jägersk., Nicoll, Ann. & Mag. Nat. Hist. (7) xvii. pp. 522-524.

From other members of the genus this species is distinguished by its comparatively large size. In a former note I commented on the great difference in size between my specimens and those of *Sp. simile*, obtained by Jägerskiöld from the same host. Beyond this I could find no difference of sufficient importance to warrant specific distinction, and the occurrence of the two forms in the same host was a reason for regarding them, if not identical, at least merely as two varieties of the same species. It not uncommonly happens, however, that two or even more species of the same genus inhabit the same host.

Jägerskiöld found a similar difficulty in distinguishing between his form and *Sp. pygmæum* (Levins.). The two forms are nearly of the same size and practically the only differences between them consist in the reversed ratio of the suckers, which, however, are very nearly equal, and in the size of the "genital body." It is to these features that I, also, am obliged to turn, in order to obtain marks to differentiate my specimens.

Since first obtaining this form I have met with it several times again, always in *Larus argentatus*, never in any other host. Renewed observations and measurements confirmed

those previously noted, except in one respect, the relative sizes of the suckers. This is by no means an easy matter to decide, for, the suckers being very nearly equal, slight contraction on the part of either is sufficient to cause it to appear smaller. In addition, owing to the method of preservation, it frequently happens that one or both suckers are deformed, *i. e.*, elongated in one direction or another. From previous measurements it was concluded that the ventral sucker was, if anything, slightly larger than the oral sucker, thus agreeing with Jägerskiöld's observations. A further extended series of measurements has caused me to alter that opinion. In a considerable number of cases I have found the suckers almost exactly equal, and in all other instances, except one, the oral sucker exceeded the ventral to a greater or less extent. This is perhaps the most essential difference between *Spelotrema excellens* and *Sp. simile*, Jägerski., apart from the diversity in size. Other possible features of distinction, such as the size of the genital body, the length of the ductus ejaculatorius, and the situation and shape of other organs will be referred to later.

In most respects my previous description is fairly accurate, but several features, the importance of which I did not then realize, were overlooked. In describing the shape, exception was taken to Jägerskiöld's term "biscuit-förmig." This term is occasionally used by continental observers; it is not very accurate, although it may be apt enough as understood by them. I preferred the term "club-shaped," but that was in reference more to the outline than to the actual body-form, in the same sense, I believe, as Brandes used the specific name *claviforme*. I can imagine no satisfactory general term to describe this shape, which is almost peculiar to the genus. If the outline were made to revolve on its long axis a club-shape would be evolved; in reality, however, there is a very considerable amount of dorso-ventral flattening, particularly in the anterior part of the body, which is extended, and the sides of which display a tendency to curl up ventrally. The presence of the large number of ova causes a bulging in the posterior part of the body, which, moreover, has an elliptical or almost circular outline. In describing *Sp. pygmaeum* (Levins.), Odhner* uses the term "keulen-förmig" and adds that in contracted conditions the breadth increases gradually from before backwards. This would involve a somewhat triangular

* Fauna Arctica, iv. (2) pp. 315-316.

outline, much as Levinson found it. Such a form is rarely, if ever, met with in *Sp. excellens* or *Sp. simile*. In contraction the anterior part of the body becomes broader, almost as broad as the posterior part, but it is always separated from the latter by a distinct constriction about the level of the intestinal bifurcation.

In my second series of measurements, specimens were found varying in length from .71 to 1.39 mm., the average being .91 mm. The maximum breadth of the anterior part of the body is .23-.37 mm.; at the constriction .21-.28 mm.; posteriorly .37-.49 mm. The average of these is .29, .24, .41 mm., being nearly in the proportion 5 : 4 : 7, and a large number of examples were found to vary very slightly from these average figures. Both suckers are small and feebly developed: the oral sucker measures .068-.086 mm. in diameter, the ventral sucker .062-.081 mm.; average .076 mm. and .071 mm. respectively, a ratio of nearly 15 : 14. The maximum limit .095 mm. previously quoted for the ventral sucker is apparently abnormal. The ventral sucker is situated at a distance of rather more than $\frac{1}{3}$ of the body-length from the posterior end, and if it be regarded as marking the boundary between the anterior and posterior parts of the body, the ratio between the two is approximately 5 : 3.

The pharynx measures .037-.062 \times .026-.044 mm., and the prepharynx is about $\frac{3}{4}$ as long. The œsophagus is narrow and may be any length from .20 mm. to .45 mm. The diverticula are about $\frac{2}{3}$ of that length; they are dilated and extend back as far as the level of the centre of the ventral sucker. In a few cases they stop short of, or exceed, this limit, but the variation in this respect is slight.

Odhner pointed out a distinction between *Spelotrema pygmaeum* and *Sp. simile*, which escaped Jägerskiöld's notice. In the latter species the base of the genital body is much larger proportionately than in the former. In *Sp. excellens* it is still larger in comparison with the size of the ventral sucker. It measures .050-.065 mm. in diameter, *i. e.*, about $\frac{4}{5}$ the diameter of the sucker. It is situated on the left side of, and close beside, the ventral sucker, which it occasionally overlaps, and it is on a level with the centre of the sucker or, as often as not, a little in front of or behind this. The vesicula seminalis lies in the middle line or a little to the right, immediately in front of the ventral sucker, sometimes slightly overlapping it dorsally. Its outline is elliptical, the long axis being directed obliquely forwards; size .09-.11 \times .07-.08 mm. The ductus ejaculatorius, issuing from its

anterior end, is not convoluted to the same extent as in *Sp. simile*: its course is, in fact, almost direct, albeit slightly sinuate, towards the genital body. This difference may be of specific importance. The testes are shaped and situated exactly as in *Sp. pygmaeum**, not as represented in my figure. The outline is oval with the long axis directly transverse. They are usually enveloped to a large extent by the uterus. The right testis is just behind the ovary, while on the left the anterior border of the testis is almost contiguous with the genital sucker. They measure $\cdot 14\text{--}\cdot 16 \times \cdot 08\text{--}\cdot 11$ mm. The ovary is on the right of the ventral sucker and is contiguous with it, the right intestinal diverticulum, and sometimes the vesicula seminalis. Its shape is somewhat variable, being pear-shaped, oval, or more irregular, but in all cases the long axis is directed obliquely downwards to the middle line of the body; size $\cdot 10\text{--}\cdot 11 \times \cdot 07\text{--}\cdot 08$ mm. The uterus starts from the posterior end of the ovary, and passing down the middle of the body forms a series of convolutions first on the right side and then on the left. The convolutions are so voluminous that no regular arrangement is apparent. The uterus fills practically the whole of the posterior part of the body not occupied by the testes and yolk-glands. Its anterior limit is the level of the anterior border of the ventral sucker. The ova are very numerous, colourless on the right, bright yellow on the left. This would appear to be a further point of distinction between this species and *Sp. simile*, for, according to Odhner, the ova in the latter are all colourless, a feature serving to distinguish it from *Sp. pygmaeum*, in which the condition is the same as in *Sp. excellens*. The ova measure $\cdot 023\text{--}\cdot 025 \times \cdot 010\text{--}\cdot 013$ mm. The yolk-glands are difficult to make out, being obscured by the ova. They lie behind and ventral to the testes, which they overlap to some extent. They appear to consist of a number of lobes on each side, but the arrangement and the exact number of the lobes I am unable to determine with certainty. Comparison with *Sp. pygmaeum* and the next species to be described would point to their number being about eight on each side. The yolk-ducts are usually visible, uniting just behind the ventral sucker, the common duct passing towards the ovary.

Spelotrema feriatum, sp. n.

This species occurred very numerously in *Pelidna alpina*, *Totanus calidris*, and *Aegialitis hiaticula*, less frequently and

* Odhner's figure, *loc. cit.*

only in immature condition in *Hæmatopus ostralegus* and *Vanellus vanellus*. In every case the habitat is towards the lower end of the intestine, the cæca, and the rectum. Occasionally a few were found as far forward as the duodenum.

It is readily distinguished from the other species of the genus by several well-marked features. The body does not display the familiar club-like outline, it has more that of a pointed oval, the posterior end being rounded. There is no marked constriction. The examples from *Vanellus* are bluntly oval, presenting the appearance of a species of the genus *Gymnophallus*, from which they are certainly hard to distinguish in their immature condition*.

In point of size it is midway between *Sp. simile* and *Sp. excellens*, the observed limits in length being .66–.91 mm.; average .77 mm. In a specimen of average length the maximum breadth is .36 mm., and is found at the level of the ventral sucker or a little behind it. The oral sucker is of large size, measuring .09 mm., and is considerably greater than the ventral sucker, which has a diameter of .075 mm. The ratio is 6:5. The ventral sucker is almost exactly a third of the body-length from the posterior end. The pharynx has an average length of .065 mm., and the prepharynx is about as long, but it varies with the state of extension. The œsophagus measures .12 mm. in length and the diverticula .28 mm. Thus the latter are nearly $2\frac{1}{2}$ times as long as the œsophagus, in marked contrast to the condition in *Sp. excellens*. Moreover, they extend as far back as the posterior border of the ventral sucker, and they are not dilated.

The genital body, situated close to the left side of the ventral sucker and rather behind the level of its centre, is comparatively small, measuring only .040 mm. in diameter at the base. The vesicula seminalis is a large ovoid, sometimes almost globular body, lying well to the right side of

* From later observation I am inclined to suspect that more than one species is under consideration here. What must be regarded as the typical specimens occur particularly in *Pelidna* and *Ægialitis*, and they present some features which are not met with in the other members of the genus. These features I have not touched on above, as I at first considered them to be abnormal; they are as follows:—The body has a distinct brownish colour, due to the presence of some pigment. The excretory system is mapped out with surprising distinctness in a series of intensely black lines, the configuration of which is much as in Jägerskiöld's figure (Centralbl. f. Bakter. xxvii. p. 734, fig. 2), but, in addition, numerous fine anastomosing tubules are also visible. Finally, there is a roundish structure, enclosing apparently two small ovoid bodies, situated between the genital body and the left intestinal diverticulum. Of the function of this structure I have at present no knowledge.

the middle line. It is thus not entirely in front of the ventral sucker, with which it is contiguous. Its long axis is obliquely transverse and the ductus ejaculatorius issues from its left end and passes round in front of the ventral sucker in almost direct course to the genital body. The testes are situated as in the preceding species. The ovary is a regularly ovoid body, with its long axis transverse and slightly depressed towards the middle line. It is on the level of the posterior border of the ventral sucker and is thus further back than in *Sp. excellens*. From it the uterus passes down the middle of the body towards the left side; it then runs round the posterior edge of the body to the right side, where it forms a few convolutions. Pursuing a transverse zigzag course it returns to the left side, almost reaching the outer edge of the body, whence it bends back again and passes forward to the genital sucker. Its topography is thus entirely different from that in *Sp. excellens*. In addition the ova are almost colourless or of a very dull hue. They measure $\cdot 020\text{--}\cdot 025 \times \cdot 010\text{--}\cdot 012$ mm. The uterus is of very limited extent and does not extend in front of the testes. The yolk-glands can thus be easily made out. They occupy the usual position ventral to and a little behind the testes. In an immature specimen their lobed structure can be distinctly seen. In *Sp. simile* Jägerskiöld figures six lobes on each side. Odhner corrects this to eight for both *Sp. simile* and *Sp. pygmaeum*. In *Sp. feriatum*, however, there seem to be seven lobes on the left side and eight on the right. Should this be the normal condition it would be analogous to that in some of the Hemiuridae, in which there are three lobes or tubes on the left and four on the right. The arrangement of the lobes is characteristic and apparently fairly constant. In each group there is a central lobe of roughly quadrilateral outline; the sides of this form, as it were, facets into which the other lobes fit. The latter are all of quadrilateral or wedge-shaped outline, broadest at their distal ends, with rounded corners. The anterior face of the central lobe and each of the lateral faces accommodates a single lobe, while behind there are three lobes in the left vitellarium and four in the right. I have observed the odd number of lobes on the left side in all the specimens examined, but it is possible that an additional lobe may be obscured. From Odhner's figure there appears to be no such regular formation of the lobes in *Sp. pygmaeum*. Jägerskiöld * represents a regular arrangement, but there is no central lobe.

* Centralbl. f. Bakter. xxvii. p. 733, fig. 1.

Spelotrema claviforme (Brandes).

Distomum claviforme, Brandes, Archiv Naturg. liv. p. 247, pl. xvii. fig. 1.

In *Pelidna alpina* and *Ægialitis hiaticula* there occurred a very large number of examples of a species which I am obliged to identify as *Distomum claviforme*, Brds., despite its author's unsatisfactory description. Brandes's note on the species is meagre and his figure is erroneous in its most important feature. It has hitherto not been redescribed. It has been alluded to, however, by Lühe * and Jägerskiöld †, both of whom were much of opinion that the species must be regarded as unidentifiable, except by the author himself. In a footnote Jägerskiöld advances the supposition that it might be included in the genus *Levin-enia* (= *Spelotrema*) and gives an interpretation of Brandes's figure in this light. I previously found occasion to agree with this interpretation and my present discovery shows how correct it is. Admitting its correctness, however, there remain three or four errors in Brandes's figure; the oral sucker is smaller than the ventral, the posterior testes (= the genital body) is much too large, and the ova are proportionately far too small. The whole drawing is of a sketchy nature ‡, so that too much weight need not be attached to these discrepancies.

The majority of my specimens exhibit the typical club-like outline in a marked degree. The anterior and posterior parts of the body are always separated by a constriction which occurs about the level of the intestinal bifurcation. The cuticular scales extend exceptionally far back (to the level of the testes at any rate). The length of the body never exceeds 40 mm. and may be as small as 23 mm. Immature specimens were never observed. The maximum breadth (posteriorly) is on an average 17 mm., while anteriorly the breadth is usually about 13 mm. As in *Sp. pygmæum*, the oral sucker is greater than the ventral, but the difference is here more pronounced. They have respectively an average diameter of 038 mm. and 031 mm. The ventral sucker is at a distance of slightly less than a third of the body-length from the posterior end. The pharynx measures 020–025 × 010–013 mm.; the pre-pharynx is about the same length as the pharynx, but it may be considerably longer or shorter. The œsophagus has

* Zool. Anzeig. xxii. p. 537.

† Centralbl. Bakter. xxvii. p. 739.

‡ As witness the representation of the uterus as a continuous tube having neither beginning nor end.

an average length of .12 mm., but it varies very much with the state of extension or contraction; the diverticula are almost constantly .08 mm. long. The latter are dilated, very wide apart, and do not nearly reach the level of the ventral sucker. In *Sp. pygmæum* they extend as far back as the posterior border of the sucker.

The genital body is situated close to the left side of the ventral sucker, on a level with its anterior half. It is of small size, the basal diameter being only .013-.014 mm. The vesicula seminalis is transversely oval and lies symmetrically in the intestinal bifurcation, a considerable distance in front of the ventral sucker. The ductus ejaculatorius is slightly sinuate. The ovary is also correspondingly far forward. It is an irregularly rounded body and is not contiguous with the ventral sucker, the vesicula seminalis, or the right intestinal diverticulum, as is the case in *Sp. pygmæum*, where it is of much greater size. The uterus occupies most of the posterior part of the body and extends forward on each side to the end of the intestinal diverticula. The ova are fairly numerous and of comparatively large size, .020-.024 \times .011-.014 mm. They are colourless on the right, bright yellow on the left. The uterus completely envelops the testes and yolk-glands, so that these organs can hardly be seen. This is probably responsible for Brandes's mistake. The testes have much the same situation, but are not nearly so large as those in *Sp. pygmæum*. The yolk-glands are behind and ventral to the testes, but division into lobes, if such, indeed, be their condition, is not distinctly marked.

From the foregoing it is apparent that in point of size, and possibly on the whole, *Sp. claviforme* approaches most nearly to *Sp. pygmæum*. Several differences have already been indicated, but they may be briefly recapitulated as follows: cuticular scales are more extensive; suckers are more unequal and the ventral sucker is further back; surrounding structures are thus relatively further forward; intestinal diverticula shorter compared with œsophagus; genital organs all smaller; uterus more voluminous, enveloping the testes*.

* A conclusive proof, which I previously neglected to adduce, that *Sp. claviforme* is not, as Brandes thought, the adult of the cercaria described by McIntosh from *Carcinus mænas* (Quart. J. Micr. Sci. 1865, p. 201) is the fact that this cercaria measures .5 \times .2 mm. (approx.). It must therefore be the larva of some larger species. A much more likely cercaria is that described by Miss Lebour (Northumberland Sea Fish. Rept. 1905, p. 6) from *Littorina rudis*, if it is not an antecedent stage of the above. It is much smaller in size (.25 mm.), but it has rather long intestinal diverticula.

In addition to the above-mentioned species I have found species of *Spelotrema* in *Alca torda*, *Oidemia fusca*, and *Oidemia nigra*, but their identity is doubtful. From *Alca* only one immature example was taken; it apparently agrees most closely with *Sp. simile*. Its length is .53 mm., maximum breadth .29 mm.; outline club-like; oral sucker .053 mm., ventral sucker $.050 \times .056$ mm.; undivided intestine .22 mm., diverticula .17 mm., reaching centre of ventral sucker; genital body on level of posterior half of sucker, not very large. Ovary on same level as sucker, pear-shaped; testes transversely oval; yolk-glands almost clear of the testes, lobed but not well developed.

The species from the scoters is in all probability *Sp. pygmæum*, which Jameson * has already found in Britain in the black scoter. I found it in great numbers throughout the intestine of *Oidemia fusca*, not so numerous in *O. nigra*. The specimens were unfortunately destroyed before they were thoroughly examined, but from notes made at the time of collection some idea of their nature is to be gained. Length up to .50 mm., breadth .24 mm.; oral sucker .044 mm., ventral sucker slightly less; pharynx $.025 \times .022$ mm.; ova $.023-.025 \times .014$ mm. These figures agree more nearly with *Sp. pygmæum* than with *Sp. claviforme*, which can be the only two species in question.

GENUS TOCOTREMA, LOOSS.

Three species have already been ascribed to this genus, viz., *T. lingua* (Crepl.), *T. concavum* (Crepl.), and *T. Muehlingi* (Jägersk.) (= *Dist. lingua*, Crepl., Mühling). They do not, however, appear to form a very homogeneous group. *Tocotrema lingua* and *T. concavum*, though agreeing in the possession of a genital sucker which includes the degenerate ventral sucker, differ in several important features, which appear to demand a generic separation. Although it is true that both possess a genital sucker, the structure of this organ is not at all similar in both. The peculiar "kegel-förmiges Körper" described by Jägerskiöld † in the sucker of *Tocotrema lingua* is not even hinted at by Mühling ‡ in his description of *Distomum concavum*. It may be concluded that such a structure is not present in the latter species, for its presence could not fail to have been noted by Mühling. My specimens of an almost identical form show no appearance on external examination of such a body, but as I

* Proc. Zool. Soc. 1902, i. p. 158.

† Bergens Mus. Aarbog, 1898, ii. p. 10.

‡ Arch. f. Naturg. lxiv. pp. 80-83.

possess no sectional preparations this evidence is not conclusive. The ventral sucker in *Tocotrema concavum* appears to be in a more degenerate condition than in *T. lingua*. Moreover, the voluminous vesicula seminalis of the latter is very much reduced in the former. A less important difference is the symmetrical arrangement of the testes in *Tocotrema concavum*, in contrast to the oblique arrangement in *T. lingua*.

The occurrence here of a new species agreeing very closely with *Tocotrema lingua* accentuates the difference between the latter and *Distomum concavum*. Moreover, considering the large number of hosts from which *Distomum concavum* has been recorded, it is quite possible that two or more closely similar species may have been confused. The form which I have obtained from *Phalacrocorax graculus* is almost identical with *Distomum concavum*, but it differs from Mühling's description in one or two important features, which may cause it to be regarded as distinct. *Distomum Muehlingi* shows considerable resemblance to *Tocotrema lingua*, and if it should prove to have a genital sucker, as opposed to Mühling's description, it would be classed in the same group. For these reasons I am inclined to regard *Distomum concavum* as the type of a genus distinct from, but closely related to, *Tocotrema*. To this genus Lühe's name *Cryptocotyle*, hitherto regarded as a synonym of *Tocotrema*, might conveniently be applied. Lühe took *Distomum concavum* as type, while the genus *Tocotrema* is founded on *Distomum lingua* as type.

Tocotrema jejunum, sp. n.

This species occurred fairly frequently in *Totanus calidris*. It is of somewhat smaller size than *T. lingua*, the length varying from .87–1.77 mm., but the normal length is probably not beyond 1.3 mm. It displays, however, an extraordinary amount of extensibility. Almost every example was well extended, and in a large number the extension was so great that they had almost the appearance of threads, the body being often bent and twisted in a grotesque fashion. As might be expected, the maximum breadth occurring in the posterior part of the body is not at all constant, varying from $\frac{1}{8}$ to $\frac{1}{3}$ of the body-length. The normal figure is probably about $\frac{1}{5}$, being found in examples of 1.0 mm. to 1.2 mm. long. The shape is not like that of *T. lingua*, the anterior part of the body being more tapering and the posterior part more rounded. In a normal specimen (1.0–1.2 mm.) the oral sucker measures .045 mm. The ventral

sucker, as in *T. lingua*, is small and is situated within the anterior part of the genital sucker. The latter has a transverse diameter of $\cdot 055$ mm. It is placed about the middle of the body, slightly nearer the posterior end. The pharynx has an almost constant size of $\cdot 038 \times \cdot 018$ mm.; the pre-pharynx is somewhat shorter. The œsophagus varies from $\cdot 06$ mm. in a contracted specimen to $\cdot 14$ mm. in an extended one. The average may be taken as $\cdot 10$ mm., or nearly $\frac{1}{12}$ of the body-length. It is therefore longer than in *T. lingua*. The intestinal diverticula are much the same as in the latter. The excretory system is also similar. The cuticle is entirely covered with scales, with the exception of a small part at the posterior extremity.

The testes have the same situation as in *Tocotrema lingua*. They are irregularly oval, with indentations on their posterior border, and they are so placed that their long axes are almost at right angles to each other. The yolk-glands have also a similar position, but they are not so extensive. As far forward as the genital sucker their situation is purely lateral, but at this level they bend in on each side and form a complete arch in front of the ventral sucker. The anterior lateral prolongations found in *T. lingua* are not present here. The ovary is a small, roughly oval, lobed body, lying a short distance in front of the testes on the right side of the middle line. A receptaculum seminis is present in the middle line between the ovary and testes. It is of variable size, being sometimes smaller and sometimes much larger than the ovary. The uterus lies between the testes and the genital sucker and laterally does not extend much beyond the intestinal diverticula. It has the appearance which is characteristic of *Tocotrema lingua*, owing to its being arranged in three fairly regular transverse convolutions. The ova are numerous and of a light brown colour. They have a distinctive shape, pointed at one end, much broader at the other. They differ in this respect from those of *T. lingua*, which are more nearly elliptical. The most important feature distinguishing the two species is the size of the ova. Jägerskiöld gives the size in *T. lingua* as $\cdot 048 \times \cdot 022$ mm., which I am able to confirm; in *T. jejunum* the size is only $\cdot 031\text{--}036 \times \cdot 016\text{--}019$ mm., the average being $\cdot 033 \times \cdot 017$ mm.

In this species the vesicula seminalis is even more voluminous than in *T. lingua*. It extends back as far as the anterior testis and is highly convoluted. At its anterior end it becomes distinctly constricted and passes into the pars prostatica. This is a large pear-shaped body, enclosed by a

distinct membrane. It is situated in the long axis of the body; broad posteriorly, tapering gradually forwards.

There is some resemblance between this species and *Distomum Muehlingi*. They are about the same size and their ova are equal, but apart from the questionable presence of a genital sucker in *D. Muehlingi*, it displays the following differences:—The outline of the body is constricted in the middle; the œsophagus is much longer; the yolk-glands do not extend in front of the ventral sucker, but are more voluminous posteriorly, uniting between the testes, which are some distance apart; the ovary is rounded; the vesicula seminalis is not voluminous; and the ova are few.

Tocotrema lingua (Crepl.).

I have already frequently referred to this species and to Jägerskiöld's excellent note on it*. It is a very common parasite of the herring-gull, its favourite habitat being the anterior end of the intestine, particularly the duodenum. In addition a new host, *Alca torda*, must be mentioned. Only one bird of this species was examined, and it yielded but a single example of the parasite, so that its occurrence may be no more than casual. It is a small specimen about 1 mm. long, with few ova, but it is undoubtedly identical with the specimens from the herring-gull.

The numerous specimens from *Larus argentatus* show a remarkable uniformity in size. The length varies from 1·5 mm. to 1·8 mm., while the maximum breadth is rather less than $\frac{1}{3}$ of the length, and occurs usually in the anterior part of the body, giving the outline the familiar tongue-shape. Occasionally the anterior part is more tapering. The cuticular scales cover only the anterior part of the body, but they extend somewhat further back than Jägerskiöld represents them. The oral sucker has a diameter of ·075–·085 mm., and the ventral sucker appears to be nearly of the same size, although it is difficult to measure the latter owing to the absence of a limiting membrane. The pharynx measures $·06 \times ·045$ mm., and the short prepharynx is about $\frac{1}{4}$ as long. The œsophagus is extremely short (·04–·06 mm.), being not more than $\frac{1}{2.5}$ of the body-length. Jägerskiöld's statement that it never exceeds $\frac{1}{5}$ of the body-length seems to be an oversight, for it never in any circumstances approaches near that length, and in his figure, which is quite correct, it is not more than $\frac{1}{3.0}$. It is thus much shorter than that of *T. jejunum* or *Distomum Muehlingi*.

* Bergens Mus. Aarbog, 1898, no. ii,

Jägerskiöld's description of the structure of the genital sucker is accurate enough, but his representation in fig. 1 does not give a true idea of its external appearance. Three main groups of muscle-fibres are seen: (1) those forming the genital cup itself, consisting of radial and circular fibres; (2) those forming the ventral sucker, consisting almost entirely of radial fibres; (3) those associated with the common aperture. These are situated almost entirely in front of the aperture, very few fibres passing backwards. Two well-marked circular bands corresponding to Jägerskiöld's HQM, VQM, fig. 2, pass almost three-quarters round the aperture. In addition from the sides and anterior border of the aperture there pass out numerous radial fibres. Of these the lateral fibres become lost in the surrounding tissue, but the anterior fibres pass over and round the ventral sucker and seem to have a certain degree of connection with it. The ventral sucker is almost separated from the genital sucker by a constriction partly surrounded by a sort of sphincter. In extended states of the animal the passage between the ventral sucker and the genital cup appears as a narrow tube.

The vesicula seminalis is more voluminous than Jägerskiöld has it. It does not reach as far back as the ovary. At its anterior end there is a distinct constriction where it passes into the pars prostatica. The latter forms an almost semicircular (U-shaped) loop directed backwards. The ascending limb narrows gradually into the ductus ejaculatorius, which passes straight forward to the genital sucker.

The ova measure $\cdot 047\text{--}\cdot 049 \times \cdot 022\text{--}\cdot 025$ mm.

GENUS *CRYPTOCOTYLE* (Lühe).

Lühe gives no definition of this genus, so I offer the following:—

Body flattened, expanded; outline oval, slightly pointed anteriorly, rounded posteriorly, margin usually irregularly crenated. Cuticle entirely covered with small scales. Ventral sucker small, situated within the large genital sucker, and only slightly differentiated from it. Cavity of genital sucker simple, with no "plug-shaped body." Vesicula seminalis not very voluminous; pars prostatica? Testes side by side, symmetrical near hind end of body; posterior border more or less indented. Receptaculum seminis well developed; Laurer's canal? Ovary irregular, lobed, on right or left side of middle line. Uterus between testes and genital sucker forming two or more transverse folds which stretch between


the intestinal diverticula (but not beyond them). Ova not very numerous, light brown, thick-shelled, measuring about $\cdot 036 \times \cdot 019$ mm. Yolk-glands, alimentary system, and excretory system as in *Tocotrema*.

Looss's subfamily Cœnogoniminae appears too heterogeneous to constitute a natural subfamily. It seems to have much more the comprehensiveness of a true family, which might be designated Cœnogonimidae (or Cotylogonimidae, if, as Braun holds, Lühe's name *Cotylogonimus* has priority). Moreover, Looss's definition of his subfamily does not cover the forms which he includes within it. For instance, the following terms do not apply to the genera *Tocotrema*, *Cryptocotyle*, and *Scaphanocephalus*:—"Body distinctly divided into narrow anterior part and plumper posterior part; genital aperture in front of, or sideways from, the ventral sucker; long axes of testes transverse to long axis of body; ovary globular; windings of uterus extend laterally to near the edges of the body; ova $\cdot 02$ – $\cdot 03$ mm. long." That such a family as the Cœnogonimidae exists there can be little doubt, but it is not easy to define its exact limits. Much depends on which features are considered of greatest importance. The genus *Ascocotyle* appears to indicate a relationship with the Brachycæliinae, and it is quite possible that the latter, along with the genera *Spelotrema*, *Levinseniella*, and *Gymnophallus*, might be included in the same family. The genera *Tocotrema*, *Cryptocotyle*, and *Scaphanocephalus*, Jägersk., represent the furthest stage which the approximation of the genital aperture with the ventral sucker has reached. They form the nucleus of a subfamily, for which the name Tocotremineæ, n. subfam., is appropriate.

Cryptocotyle concavum (Crepl.) ?

This form occurred very numerously in *Phalacrocorax graculus*; over a hundred examples were taken from one bird. The favourite habitat is the anterior part of the intestine and the duodenum. *Distomum concavum* has been recorded by several observers from a large number of hosts. Mühlhling's description of the species is the most exhaustive, and he was the first to discover the true nature of the genital sucker, but my specimens do not entirely coincide with his description.

A prepharynx is not entirely absent, but is short, being only $\frac{1}{3}$ of the length of the pharynx. The œsophagus is also slightly shorter than the pharynx, and thus much shorter

than Mühling has it. The peculiar inward bend of the intestinal diverticula as they approach the genital sucker is a constant feature, as is also their inward inclination at their termination. The yolk-glands are, as a rule, somewhat more voluminous than Mühling represents them, and occasionally form a continuous arch in front of the genital sucker. The yolk-ducts pass along the anterior border of the testes, and unite in a receptacle of variable size a little to the left of the middle line. The receptacle is capable of comparatively enormous dilatation. The fairly large, oval receptaculum seminis is situated immediately in front of the testes in the middle line. The testes are much as Mühling represents them and measure $\cdot 18\text{--}\cdot 26 \times \cdot 11\text{--}\cdot 16$ mm. With regard to the situation and shape of the ovary, my observations disagree entirely with those of Mühling. In my specimens it occurs on the right side of the body, directly in front of the right testis. It has the form of a scalene triangle, the longest side facing forwards; the shortest side lies along the receptaculum seminis, while the third side is parallel to and almost contiguous with the anterior border of the right testis. The latter sides are regularly lobed, there being four or five lobes on the side next the testis and two or three on that next the receptaculum seminis. The lobes are not of great depth. The anterior face is more even. The uterus has a characteristic appearance. It makes first a short turn to the left, then stretches across the body to the right side, whence it bends back again to the left side, and turning forward proceeds to the genital sucker. Its shape is therefore -like, with two short turns at the ends of the limbs. It never extends over the intestinal diverticula. In Mühling's figure the uterus traverses the body four times. The ova are not very numerous, light brown in colour, with a thick shell. They are more pointed at one pole than appears from Mühling's representation. Their size is $\cdot 034\text{--}\cdot 037 \times \cdot 018\text{--}\cdot 019$ mm.

Putting aside the possibility of error on Mühling's part, which does not seem likely, only two alternatives remain: we have here to deal with a case of "situs inversus" of the ovary, which is not uncommon in certain species, or my specimens must represent a distinct variety or species. To elucidate the matter I examined more than fifty examples and succeeded in finding one with the ovary on the left side, the bend of the uterus directed towards the same side and the yolk-receptacle on the right. Even then it did not resemble Mühling's figure, for the ovary retained its characteristic shape, the yolk-receptacle was on the opposite side

of the body, and the uterus traversed the body only twice. The possibility of amphitypy and slight error on Mühling's part causes me to hesitate in separating my specimens specifically from *Distomum concavum*. I therefore include them under that species for the present, in the hope that further investigation will prove them identical or distinct.

My specimens varied in length from .68 mm. to 1.06 mm., and in breadth .40-.66 mm., the average size being $.81 \times .54$ mm. The maximum breadth is therefore $\frac{2}{3}$ of the length. The oral sucker has an average diameter of .060 mm., and the genital sucker measures $.15 \times .11$ mm. The size of the ovary is about $.13 \times .07$ mm.

Genus GYMNOBALLUS, Odhner.

Gymnophallus dapsilis, sp. n.

Occurred frequently in the Bursa Fabricii of *Oidemia fusca* and *Oidemia nigra*. It resembles in its habitat and in other respects *Gymn. bursicola*, Odhn., from *Somateria mollissima*.

It differs from all other species of the genus in having the yolk-glands in front of the ventral sucker, and this is the principal difference between it and *Gymn. bursicola*. Mature specimens varied in length from .84 mm. to 1.13 mm., the average being very approximately 1 mm., and, in fact, most of the examples varied but little from that size. One specimen .75 mm. long contained ova, but it was an exception. Immature forms were found as small as .68 mm. The maximum breadth at about the middle of the body was .45-.80 mm., average .63 mm., or nearly $\frac{2}{3}$ of the length. The general outline is a regular oval with rounded ends. The cuticle is entirely covered with sharp scales, .006 mm. long; it gives the body a firm consistency and when ruptured by pressure the fracture is sharp.

The oral sucker is circular, with a diameter of .16-.21 mm., i. e., about $\frac{1}{5}$ of the body-length. The ventral sucker is smaller, .14-.17 mm., and lies almost exactly $\frac{1}{3}$ of the body-length from the posterior end. In immature specimens the suckers tend to be more nearly equal. The pharynx is continuous with the mouth and is almost circular in outline, with a diameter of .068-.087 mm. The œsophagus is about the same length as the pharynx. The diverticula are short and wide and extend very slightly beyond the middle of the body. The excretory vesicle resembles that of *Gymn. bursicola*, but the bifurcation is nearer the ventral sucker. The limbs end near the edge of the body at the level of the pharynx.

The testes are small longitudinally oval bodies, situated to the outer side of the excretory tubes and on a level with the posterior border of the ventral sucker or slightly further forward. They are symmetrical about the middle line and measure $\cdot11 \times \cdot08$ mm. The ovary is a short distance in front of the right testis, on the level of the anterior border of the ventral sucker. It is round and slightly larger than the testes. The position of the yolk-glands is almost invariably in front of and dorsal to the ventral sucker. Occasionally they are a little further back, but in only one instance were they found beyond the centre of the sucker. They are symmetrical about the middle line and consist of a number of small loosely-knit follicles.

The uterus is confined to the space between the two suckers. In one case out of sixty a few ova were observed behind the ventral sucker on the left side, and this was the case in which the yolk-glands were so far back, thus it must be regarded as abnormal. The ova are light yellow and fairly numerous. They present one of the most peculiar features of the animal, and it is surprising that no mention has been made of a similar peculiarity in connection with the other species of the genus. It consists in the presence in the same specimen of ova of very different sizes, the largest being as much as eight times the size (volume) of the smallest. This, moreover, is not a rare occurrence, but is to be met with in almost every other specimen. In several instances hardly any two ova were of the same size, and almost every length between a minimum of $\cdot012$ mm. and a maximum of $\cdot031$ mm. was observed. The smallest ova displayed a fairly constant size of $\cdot012 \times \cdot009$ mm., while what may be assumed to be the normal ovum (*i. e.* such as was found in an example possessing ova of nearly uniform size) measured $\cdot025\text{--}\cdot031 \times \cdot017\text{--}\cdot019$ mm. This corresponds fairly well with the size of the ova in *G. bursicola*. No explanation of this apparent vagary suggests itself at present; the phenomenon is unique, to my knowledge. It can hardly be the case that the ova when first formed are of small size and grow in the course of their passage through the uterus, for the small ova are found throughout the latter even near its termination; in addition the shell is of a bright yellow colour, which is not usually the case in newly-formed ova. Many large colourless ova are also sometimes to be seen in the vicinity of the ovary. The condition is much more probably pathological, but its occurrence in so many specimens seems opposed to this view.

The vesicula seminalis is a large ovoid body on the left of

and slightly overlapping the ventral sucker. It is on the same level as the ovary. The pars prostatica is also of considerable size; it lies directly in front of the ventral sucker, obscured to some extent by the yolk-glands.

From the foregoing it is apparent that this species, while bearing a close resemblance to *G. bursicola*, Odhner, has at least half a dozen constant features of difference. This species has some claim to be considered as the adult of the pearl-forming Trematode of *Mytilus edulis*. Odhner* has a note on this subject in which he criticizes Jameson's† observations. He shows that the specimens which the latter obtained from *Oidemia nigra* and identified with *Distomum somateriae*, Levins., belong, at least in part, more probably to *Gymn. bursicola*. He also corrects Jameson's obvious error that such small specimens as he found could be the adults of the large cercariæ in the mussel. He considers *Gymn. bursicola* as the most probable adult of these cercariæ, and there is no reason why this should not be the case. The claims, however, of this new species appear equally strong. Its dimensions allow for a fair increase in size in attaining maturity, while the immature specimens obtained in *Oidemia fusca* are only a little larger than the cercariæ in *Mytilus*. The difficulty‡ of proving the identity of the sporocyst stage in *Cardium edule* and *Tapes pullastra* with the cercariæ in *Mytilus* still remains, and it is quite possible that they may be distinct. There must be at least six or seven distinct cercariæ of this type to correspond with the number of species of the genus *Gymnophallus*.

Genus MARITREMA, gen. nov.

Body flattened, leaf-like, more or less elongated oval, sometimes tongue-shaped. Anterior end usually somewhat more pointed than posterior end. Cuticle provided with minute scales over a considerable extent. Suckers small and nearly equal; the ventral sucker is situated about the middle of the body. The intestinal diverticula may be short and sac-like or more elongated and narrow, but in no case do they extend beyond the testes; the bifurcation takes place nearer the ventral than the oral sucker. The excretory system (in *Maritrema gratiosum*) consists of a small vesicle from which two narrow tubules run forward; in front of the intestinal bifurcation they begin to widen and bend in

* Fauna Arctica, iv. (2) p. 312.

† Proc. Zool. Soc. 1902, i. pp. 151-160.

‡ Vide Ann. & Mag. Nat. Hist. (7) xvii. p. 151.

towards the middle line. Just in front of the pharynx they unite in the middle line, forming a wide commissure. From this a short wide branch runs forward on each side. Ovary situated immediately behind the ventral sucker, median or somewhat to the right; it has a characteristic trilobate outline, the base facing outwards and the apex median. Uterus very voluminous, occupying the greater part of the body behind ovary, but not extending in front of the latter. Ova numerous, oval, colourless on left side of body, yellow on right. Size $\cdot 016\text{--}\cdot 022 \times \cdot 008\text{--}\cdot 012$ mm. Yolk-glands of limited extent, confined to a fringe along the edge of the posterior part of the body. At the level of the testes this fringe bends inwards, passing along the anterior border of testes to unite in the middle line, so that almost a complete circle is formed. Receptaculum seminis absent (?). Laurer's canal (?). Testes symmetrical about the middle line, a little behind the ovary; outline oval, long axis usually transverse, sometimes decidedly oblique. Vesicula seminalis large, oval, on the right side of and close to the ventral sucker, behind which it extends some distance. It is enclosed in a well-marked cirrus-pouch. This has a somewhat pear-shaped outline, narrowing in front of the vesicula seminalis. The narrow part contains a short pars prostatica and passes round in front of the ventral sucker. The genital aperture is on the left of the latter, a little behind the level of its anterior border. The vagina passes up on the left side of the sucker.

Habitat, the intestine of birds. Type, *Maritrema gratiosum*, sp. n., from *Pelidna alpina*. Other species, *M. lepidum*, sp. n., and *M. humile*, sp. n.

Maritrema gratiosum, sp. n.

This occurred frequently in large numbers in *Pelidna alpina* and *Ægialitis hiaticula*. A few immature specimens from *Larus ridibundus* and *Hæmatopus ostralegus* are probably best referred to this species, although they do not wholly agree with the mature examples. The habitat is most usually the anterior part of the intestine.

The body is flattened and somewhat elongated, with a tendency to assume a tongue-like outline. There is usually a slight constriction near the level of the ventral sucker. The length varies from $\cdot 45$ mm. to $1\cdot 10$ mm., the maximum breadth from $\cdot 24$ mm. to $\cdot 44$ mm., or $\frac{1}{3}\text{--}\frac{1}{2}$ of the length. As in *Spelotrema* species, considerable difficulty was experienced in determining the relative sizes of the suckers. Of the

specimens measured about 60 per cent. showed the oral sucker greater than the ventral, but taking the average of the figures obtained it was found that both approximated .050 mm. The limits in each case are .043–.062 mm. The suckers are therefore very nearly equal, the oral sucker being usually a little the larger. In the immature specimens from *Hematopus* and *Larus ridibundus* the oral sucker is invariably distinctly greater. The oral sucker is subterminal and the ventral sucker is almost midway between the anterior and posterior ends of the body. The prepharynx is usually of considerable length, .062 mm. on an average, being nearly twice as long as the pharynx, which measures .033 × .016 mm. In the *Hematopus* and *Larus* specimens the prepharynx was usually much shorter. The œsophagus measures .06–.16 mm., being $\frac{1}{5}$ – $\frac{1}{4}$ of the body-length. The diverticula are more than twice as long, .16–.37 mm., and this forms an important point of difference between this species and the other two species of the genus. They always extend as far back as the anterior border of the testes.

The ovary is situated immediately behind the ventral sucker, median or a little to the right. The characteristic trilobate outline is well marked. The uterus is so voluminous that its convolutions cannot be followed. It first fills the left side, where the ova are colourless, then passes to the right, where they are yellow in colour; the condition is thus the reverse of that in *Spelotrema*. The numerous ova measure .020–.022 × .010–.012 mm. The yolk-glands have the situation and extent already noted in the definition of the genus, and this is constant for all three species. The testes are not overlapped by the uterus to any great extent, so that they are probably almost as thick as the body itself. Their outline is elongated oval, and their long axes are directed more or less obliquely upwards towards the middle line. In the specimens from *Larus ridibundus* the long axes are directly transverse, while in those from *Hematopus* the testes are almost globular. The shape and position of the cirrus-pouch have been noted in the definition of the genus. The vesicula seminalis within the pouch had a perfectly oval outline and is proportionately smaller in this species than in the other two. It does not extend much further back than the middle of the ovary. The terminal portion of the vagina has a sinuate course.

Maritrema lepidum, sp. n.

This occurred only in the intestine of *Larus argentatus*. It is about the same size as the previous species, but differs

in the following respects:—The suckers are proportionately larger and the oral sucker is distinctly greater than the ventral, their diameters being respectively $\cdot 068$ mm. and $\cdot 059$ mm. The ventral sucker is situated in front of the middle of the body. The pharynx is of the same size as that in *M. graciosum*, but the prepharynx is shorter. The œsophagus is about the same length in both; the diverticula are here distinctly shorter, not extending beyond the level of the ventral sucker. They are straighter and wider, and are only $1\frac{1}{2}$ times the length of the œsophagus.

The ovary is the same as before, but always slightly to the right and somewhat smaller. The condition of the uterus is also similar; the ova are quite as numerous but smaller, measuring only $\cdot 018$ – $\cdot 019 \times \cdot 009$ – $\cdot 010$ mm. The testes are further forward, the right testis being almost contiguous with the ovary and the vesicula seminalis. Their long axes are always, so far as I have observed, directly transverse, and they are not overlapped by the uterus to any great extent. The vesicula seminalis is much larger, extending back as far as the anterior border of the right testis. The course of the vagina is distinctly Z-shaped.

Maritrema humile, sp. n.

This was found in large numbers in the intestine of *Totanus calidris*. It is a very small species, measuring only $\cdot 28$ – $\cdot 40$ mm. in length, with a maximum breadth of $\cdot 12$ – $\cdot 16$ mm. The cuticle is almost entirely covered with scales. Unlike the other two species, it has the oral sucker less than the ventral, the diameters being respectively $\cdot 025$ – $\cdot 031$ mm. and $\cdot 030$ – $\cdot 034$ mm. The ventral sucker is very nearly in the middle of the body. The pharynx measures $\cdot 019 \times \cdot 010$ mm., and the prepharynx is about the same length. The œsophagus is $\cdot 04$ – $\cdot 05$ mm. long, or nearly $\frac{1}{8}$ of the body-length, while the diverticula are almost twice as long. The latter are dilated, wide apart, and only reach the level of the anterior border of the ventral sucker.

The ovary, uterus, and yolk-glands are the same as in the other two species. The ova are still smaller than those of *M. lepidum*, being only $\cdot 016$ – $\cdot 018 \times \cdot 008$ – $\cdot 011$ mm. The testes are almost entirely enveloped by the uterus and their position is not obvious. They are symmetrical, transversely oval, and further back than in *M. lepidus*. The vesicula seminalis is a comparatively large structure, and the cirrus-pouch has exceptionally thick walls. It measures $\cdot 093 \times \cdot 032$ mm., and occasionally overlaps the ventral sucker to a considerable extent.

In connection with the above described three species it is interesting to read Jägerskiöld's note, in which he says:—"During my search for *Levinsenia brachysoma* I have found that there are quite a number of small Distomids, having the habitat of a *Levinsenia*, but so different in their copulatory organs that we are compelled to assign them to other genera. Thus, for example, in the intestine of *Charadrius hiaticula* a small Trematode was found in great numbers, which on superficial examination might have been mistaken for a *Levinsenia* sp., but on closer inspection displayed a cirrus and a cirrus-pouch"*. I have no doubt that he had before him members of the genus *Maritrema*, and in particular *M. gratiosum* and *M. humile*.

Equally interesting is the occurrence in *Paludetrina stagnalis* of two cercariæ, *C. oocysta* and *C. pirum*, first discovered and described by Miss Lebour †. These show very close resemblance to species of the genus *Maritrema*. *C. oocysta* shows well-marked testes, ovary, and cirrus-pouch, and has thus reached a very advanced stage of development for a cercaria. In many respects it agrees closely with *Maritrema humile*, but the fact that the oral sucker is greater than the ventral seems opposed to its identification as the larval form of that species. *Cercaria pirum* has not attained such a degree of development, there being no evidence of genital organs, but the configuration of the alimentary and excretory systems leaves little doubt that it is the larva of some *Maritrema* species. The anterior commissure of the excretory system differs only from my description of a similar structure in *M. gratiosum* in being behind the pharynx instead of in front. The suckers are practically equal, which agrees with the condition in *M. gratiosum*, but the intestinal diverticula are shorter. It is thus impossible at this stage to identify the cercariæ with certainty, but there can be no doubt that they belong to this or some closely allied genus.

Genus *PSILOSTOMUM*, Looss.

Psilostomum brevicolle (Crepl.).

I have found this species not only in the intestine and cæca of *Hæmatopus ostralegus*, but frequently also in the intestine, cæca, and rectum of *Oidemia fusca*, and in the intestine of *O. nigra*. *Psilostomum oxyurum* (Crepl.) has

* Centralbl. f. Bakter. xxvii. p. 739.

† Trans. Nat. Hist. Soc. Northumberland &c., new series, vol. i. pt. 3, pp. 445-6.

already been recorded from *Oidemia nigra*, but this is, I believe, the first time that *P. brevicolle* has been met with in the scoters. The most recent note on the species is by Braun*, in the course of which he criticises Mueller's observations†. My specimens are small, 1·74–3·41 mm. long with a breadth of ·35–·54 mm. They are somewhat cylindrical anteriorly, more flattened posteriorly, agreeing in this respect with Braun's specimens. The posterior end is usually rather blunt. With regard to the length of the neck (distance between centres of suckers, as I take it) my specimens are apparently much more extended than those of Mueller or Braun, for I find the proportion to be nearly constantly $\frac{1}{3}$ of the body-length, certainly never less than $\frac{1}{4}$, and in young examples much more. The constriction behind the ventral sucker is not a mere narrowing in the breadth, but is usually accompanied by distinct transverse annulation of the cuticle. The breadth here is only about half that at the widest part of the body. The oral sucker is slightly larger than the ventral. The latter is, as Braun says, usually deeper, although in extension of the anterior part of the body the oral sucker may be quite as deep. There is practically no prepharynx. The pharynx is almost globular, measuring ·14–·21 × ·12–·22 mm.; it is thus somewhat larger than Braun has it. He is correct in saying that the œsophagus is extremely short, the bifurcation taking place almost immediately behind the pharynx.

The testes are contiguous or very nearly so, and the posterior is most often but not invariably the larger. With regard to the ova, there seem to be great variations in size, although when the large size of the ova is taken into consideration the variation is not excessive. The observations of Mueller and Braun show an apparent discrepancy; the former gives the dimensions as ·12–·13 × ·1 mm., the latter ·104 × ·08 mm. This difference must result from the fact that Mueller had only measured the larger ova and Braun the smaller. With the view to explain this difficulty I measured the ova in upwards of 30 examples, and find the limits in length to be ·100–·124 mm., and in breadth ·062–·078 mm. These limits do not represent isolated examples, for all sizes between them were observed. The average figures are ·1118 × ·0685 mm., but this does not imply that such a size is commoner than others. From this it is obvious that Mueller's figures, which are at best a rough approxima-

* Zool. Jahrb. Syst. xvi. pp. 12–13, pl. i. fig. 9.

† Arch. Naturg. lxiii. p. 19, pl. iii. fig. 2.

tion, are too high, and that Braun probably was contented with measuring a very few ova. Both find the breadth too great. These observations, I may add, were conducted almost entirely on specimens from *Hæmatopus*.

XXXIX.—*Preliminary Report on the Monaxonellida of the National Antarctic Expedition.* By R. KIRKPATRICK.

THE *Monaxonellida* brought home by the 'Discovery' include 43 species, of which 24 are new. Most of the specimens came from the neighbourhood of the Winter Quarters (lat. $77^{\circ} 49' S.$, long. $167^{\circ} 7' 4'' E.$).

Polymastia invaginata, sp. n.

Sponge hemispherical, free or attached, covered with a thick pile of pointed spicules; with one large oscular papilla usually completely invaginated, so that the summit of the oscule is on a level with, or below, the general surface. Under surface with a fleshy basal pad.

Colour in spirit pale yellow above, and often grey and semi-transparent on the under surface in free specimens. Consistence dense and firm.

Skeleton.—Choanosomal, formed of fibres curving upwards from the base to the periphery, penetrating the cortex, and forming the thick surface pile; with stellate groups of small tyles between the fibres.

Cortical skeleton formed of a dense layer of vertical tyles of various lengths embedded in a tough fibrous layer from $\cdot 5$ to $1\cdot 25$ mm. thick.

Basal skeleton consisting of spicules transversely arranged, and crossing each other in an irregular manner.

Spicules.—Large, smooth, slightly curved styles, or occasionally strongyles, $2240 \times 40 \mu$.

Cortical tyles with small spheroidal head, short neck, fusiform straight shaft, varying in length from 140 to 350μ , and in thickness from 12 to 19μ . A few very slender styles scattered in the choanosome, $70 \times 6 \mu$, with head and neck making an angle with the shaft. Some medium-sized cortical tyles in the oscular papilla have long, oval heads. Tyles of the stellate clusters slender, with the head making an angle with the shaft, $200 \times 15 \mu$.

Localities. Winter Quarters, 10–30 fath.; off Mt. Erebus, 500 fath.

Sphærotylus antarcticus, sp. n.

Sponge dome-shaped or spheroidal, attached or free. Surface beset with a dense short pile of cortical microtyles; with several usually elongated papillæ with or without a large terminal orifice. Dermal pores distributed over the cortex, each pore opening into a single tubular canal in the cortex; the mouth or pore of the pore-canal is guarded with a ring of radiating cortical tyles. Flagellated chambers diplodal.

Skeleton formed mainly of radiating fibres composed of styles, with diverging brushes of spherostyles near the surface. Cortex with a surface-layer of densely packed tufts of small vertical tyles, and a subcortical layer of tangential styles and tyles.

Spicules.—Spherostyles 8 mm. in length by $30\ \mu$ in diameter in the middle, and $14\ \mu$ in the region below the distal knob; distal knob $28\ \mu$ in diameter, hemispherical, with granular surface and with a few square teeth or serrations on the edge.

Styles straight, fusiform, blunt-pointed, 2.8 mm. in length, $41\ \mu$ in diameter in the middle, $23\ \mu$ in diameter at the rounded end.

Cortical tyles curved, $146\ \mu$ long, head $3.25\ \mu$ in diameter; neck slender, $2.75\ \mu$ thick, with broad oar-blade-like shaft, but circular in section, $7\ \mu$ thick.

Styles of lower cortical tangential layer, also in choanosome, $900 \times 20\ \mu$. Tyles of the same layer nearly straight, $270\ \mu$ long, with head $7\ \mu$ in diameter and relatively thick neck $6.8\ \mu$ in diameter.

Slender, curved tyles, $460 \times 10\ \mu$, scattered in choanosome.

Young specimens are oval, with one long closed papilla; the bundles of divergent exotyles are more or less separate and distinct, and the distal knobs retained and not broken off.

Locality. Winter Quarters, 10–30 fath.

SIGMAXINYSSA, gen. nov.

Cup-shaped Axinellidæ with longitudinal skeletal fibres joined by transverse ones on the inner aspect, and with tufts given off at right angles to these on the outer aspect. Megasccleres, oxeas; microsccleres, sigmata and toxa.

Sigmaxinyssa phakellioides, sp. n.

Sponge sessile, cornucopia- or cup-shaped. Inner surface

smooth, outer surface coarsely pilose. Consistence rather hard, but flexible. Colour in spirit greyish drab. Inner surface with numerous small oscules, each about 1 mm. in diameter; outer surface pilose, with dermal membrane perforated by round pores $95\ \mu$ in diameter.

Skeleton.—On inner surface formed of close-set longitudinal lines joined by cross-bars, and giving off tufts of fibres, which proceed outwards at right angles to the outer surface, pushing up the dermal membrane, but barely projecting beyond it.

Spicules.—Oxeas, $835.5 \times 42.25\ \mu$, curved at centre, sharp-pointed. Sigmata, $81.25\ \mu$ long, $35.75\ \mu$ broad, and $3.25\ \mu$ thick, often with an angular bend at centre of shaft. Toxa, $130\ \mu$ long and $3.25\ \mu$ thick at centre, with smooth surface.

This species bears in its outward aspect a very close resemblance to cup-shaped species of *Phakellia*; also the skeletal arrangement is like that of *Phakellia*; the oxeas, sigmata, and toxa are those of a typical *Gellius*. The Axinellid genus *Sigmaxinella*, Dendy, which has microscleres in the form of sigmata, has styles for megascleres.

Locality. Coulman I., 100 fath.

Hymedesmia exigua, sp. n.

The sponge forms a thin translucent greyish-white crust, about 5 mm. in diameter, on a stone. The surface is smooth, and the substance of a fleshy consistence.

Skeleton.—The choanosome contains scattered short acanthostyles, and the dermal membrane tangential tyles isolated or in bundles of a few.

Spicules.—Megascleres: acanthostyles, $94 \times 19\ \mu$, short, thick, with spines pointing backwards slightly. Ectosomal tyles, $157 \times 3.5\ \mu$, straight, smooth, with oval heads, $5\ \mu$ long and $4.5\ \mu$ broad.

Microscleres: pluridentate isancoræ spatuliferæ at each end, with five foliate teeth, $5\ \mu$ in length, sometimes with three or four; shaft deeply curved, $2.5\ \mu$ thick, sometimes with central alate expansions.

Sigmata, $9.6\ \mu$ long, $5.6\ \mu$ broad, $.5\ \mu$ thick, scattered separately in the choanosome.

This new species resembles in several respects *H. zetlandica*, Bowerbank, but the ancoræ of the latter have only three teeth, the sigmata are much longer ($51\ \mu$) and in sheaves; also the ectosomal tyles are much larger, viz. $328 \times 3.25\ \mu$, and the spines of the acanthostyles more verticillate. *Hymedesmia irritans*, Thiele, from Juan Fernandez, has nearly the

same spicular elements, but of different dimensions, and has the labis among its microscleres.

Locality. Off Balleney I., 254 fath.

Hymerrhaphia rufa, sp. n.

The sponge forms a thin mud-coloured brown crust on a branched Polyzoon. The surface is smooth, and no pores or oscules are visible. The consistence is rather tough.

The *skeleton* of the choanosome is formed of longer and shorter acanthostyles dressed vertically, that of the ectosome being formed of tangentially arranged anisotornotes, either isolated or in bundles.

Spicules.—Megascleres: larger acanthostyles, $312 \times 25 \mu$, swollen at the head, spined all over, with larger curved spines at the head. Smaller acanthostyles, $131 \times 18.75 \mu$. Anisotornotes of ectosome, $344 \times 12 \mu$, straight, fusiform, attenuating gradually at one end but abruptly at the other.

Microscleres: isancoræ, 28.5μ long, with three or four teeth at each end; rarely the teeth are not developed, the ends being in the form of hemispherical cups.

Dredged near Winter Quarters, No. 10 hole, 130 fath.

Ophlitaspongia nidificata, sp. n.

Sponge massive, of an inverted pyramidal shape, sessile, narrow and contracted at the point of attachment. Surface uniformly coarsely spinous. Circular oscules ($\cdot 7$ mm. in diameter) on the upper surface, at the bases of the spines; (pores closed). Subdermal cavities flat and shallow. Flagellated chambers diplodal. Colour dirty grey, the tips of the spines being yellowish. Consistence hard and tough.

Skeleton consisting of dense branching axes of styles cemented with spongin and echinated by smooth styles passing at right angles from the axis to the surface. Ectosomal spicules in form of slender straight styles. Considerable tracts of dermal membrane were devoid of these spicules.

Spicules.—Megascleres: large, straight, smooth styles, on an average about $1000 \times 50 \mu$. Also smooth curved kind, 625μ long. Ectosomal styles straight, smooth, tapering gradually to a point, $406 \times 9 \mu$.

Microscleres: toxa smooth, 638μ long, 6.25μ thick at the centre. These spicules occur in nests or groups of five to ten.

This new species comes well within the genus *Ophlitaspongia*, Bk., as emended by Dendy. *O. seriata*, Bk., *O. subhispidata*, Carter, and *O. membranacea*, Thiele, all have toxa,

but the first and third species are encrusting, and the second has long slender branches.

Dredged off Coulman I., 100 fath.

LISSOMYXILLA, Hanitsch.

This genus was established by Hanitsch* to include Ectyonine Sponges with fibres having a core of smooth styles echinated by acanthostyles with special ectosomal megascleres, and with or without microscleres. Unfortunately the species he selected as type of the genus (*Tethea spinosa*, Bowerbank) in no way fell in with the definition, since, as Topsent† points out, this species has neither echinating spicules nor special ectosomal spicules, and Topsent refers *Lissomyxilla* to the limbo of useless names. Among the 'Discovery' sponges, however, is a specimen which fits in with Hanitsch's definition of *Lissomyxilla*, which runs:—"Skeleton fibres of the choanosome formed of smooth monactinals echinated by spined styles. Megascleres of the ectosome smooth diactinals or monactinals. Microscleres (isochelæ &c.) may be present." Accordingly I propose to revive the name.

Lissomyxilla Hanitschi, sp. n.

There are two much-worn species of this sponge of a dark, dirty-grey colour, and a third young small specimen, whitish in colour, growing on a specimen of *Hornera*. The largest specimen is 4 cm. high and 5 cm. in diameter at the base; the dermal membrane is worn away, exposing several openings of exhalant canals, 4 mm. in diameter. The dermal membrane of the smallest specimen is transparent, smooth, and raised up at one place into a small conical oscule, with radial tangential spicules in its walls.

The *skeleton* of the choanosome is formed of branching fibres on an average about 150 μ thick, echinated by spined styles in an obscurely verticillate manner, the whole skeleton, as seen in sections, having a somewhat confused appearance. The ectosomal spicules partly proceed obliquely from the main fibres to the dermal membrane, and partly lie tangentially in that membrane.

Spicules.—Megascleres: styles, 500 \times 19 μ , smooth, curved near the head, sharp-pointed. Echinating acanthostyles,

* Trans. Liverpool Biol. Soc. vol. viii. p. 194 (1894).

† Archiv. Zool. Exp. et Gén. (3) tome viii. p. 265 (1900).

$219 \times 18.75 \mu$ (without including spines), larger spines on the head 9μ long. Ectosomal amphityles, $356 \times 11 \mu$, straight, very slightly fusiform, subtylote, and with a small mucro at each end. Microscleres none.

Myxilla victoriana, Dendy (*Halichondria pustulosa*, Carter), would come under this genus, although, at the same time, it is in possession of isochelæ, and the heads of the styli of the main fibres occasionally have a slight indication of spination.

Localities. Coulman I., 100 fath.; east end of Barrier, 100 fath.

Iophon spatulatus, sp. n.

Sponge slender, cylindrical, branched. Colour pale brown in spirit. Oscules oval, about $1 \times .6$ mm. in diameter, slightly raised; surrounded by a radiating zone of tytes. Pores in sieve-like areas 2–3 mm. in length and about 2 mm. in breadth, on a level with the general surface.

Flagellated chambers $26 \times 23 \mu$.

Skeleton.—Dermal: a closely packed layer of dermal tytes.

Choanosomal: a loose network of multispicular fibres 3–6 spicules thick forms the core of the cylinder. From the central core are given off at right angles fibres one or two spicules thick which support the dermal membrane.

Spicules.—Megasccleres: smooth styles, $462 \times 25 \mu$, with a mucro at the basal end. Ectosomal subtyles $225 \times 12.5 \mu$, fusiform, with the swelled ends smooth laterally, and with the extremities only slightly convex, in fact almost truncate, and covered with spines.

Microscleres: palmate anisochelæ 18.7μ long, 6.2μ broad (front view).

Bipocilla rare, 13.6μ long, 1.15μ thick, shaft deeply curved, slightly twisted, and with ends almost similar, spatulate, with crenulated edges; occasionally with five relatively large denticles in place of the finer crenulation. A second kind of bipocilla have a longer, less curved shaft, with scoop-like rather than spatulate ends, each scoop having four or five denticles. One example has three sharp prongs at one end and the spatulate prolongation at the other.

The species is represented by numerous small, for the most part fragmentary, slender cylindrical pieces.

Since writing the above description accounts of two new species of *Iophon* from the Antarctic have been published by Topsent, viz. *I. unicornis* and *I. pluricornis*. The two new species described in the present Report and Topsent's two species all possess the curious modified acanthostyles. *I. unicornis*, Topsent, has no bipocilla, and *I. pluricornis* has

bipocilla apparently of the typical form; the present two species both have spathulate bipocilla with crenulated ends; and, further, there are differences, viz. in the shape of the body, the arrangement of the skeleton, and the character of the ectosomal spicules, which lead me to regard the 'Discovery' specimens as belonging to distinct species.

Localities. Winter Quarters, 25-30 fath.; Coulman I., 100 fath.

Iophon flabello-digitatus, sp. n.

Sponge forming a large palmato-digitate or digitate growth in one plane; branches compressed, usually with oscules along one edge. Surface finely verruculate; with elongated pore-areas supported by fan-like wisps of ectosomal spicules.

Colour dark brown; consistence soft, the sponge being readily broken.

Skeleton typically formed of a network of spiculo-fibre, the primary lines of which proceed upwards and outwards from the inner surface of oscular tubes to the outer surface of the sponge, where their ends form the verrucæ; the secondary fibres join the primary at right angles, forming rectangular meshes about 1.25 mm. square. The thickness of the primary fibres is about .7 mm., that of the secondary about .5 mm.

The ectosomal skeleton consists of fan-like bundles and wisps of spicules, isolated or proceeding upwards and spreading out from the terminal main fibres.

Spicules.—Megasccleres: smooth styles, $590 \times 25 \mu$, curved, with a mucro at the head end.

Ectosomal spicules, $344 \times 12.5 \mu$, subamphitylote, fusiform, with a marginal ring of vertical spines at both ends and a terminal central spike at one extremity.

Microsccleres: palmate anisochelæ of two sizes, a large kind 35μ long and 10.7μ broad, with thick shaft, with triangular palmate tooth, 17.5μ long, at the large end, not quite as long nor as broad as the alæ; lower margin of alæ convex. Lower central tooth with a curved upper edge produced into a spine.

A small kind, 17.5μ long, 6.2μ broad; upper palmate tooth triangular, rounded above, as broad and as long as the alæ; lower border of alæ concave; lower tooth with simple rounded upper edge.

Bipocilla varying in length from 5.5 to 11μ , according to the convexity of the shaft, which is usually deeply curved; both ends spathulate, nearly similar, and with crenulate edges, or with 5-7 teeth.

The fine specimen (no. 184) which constitutes the type of the new species is 24 cm. wide and 25.6 cm. high.

Locality. Winter Quarters, 28–130 fath.

Myxilla decepta, sp. n.

There are two very small specimens of this species: one is in the form of an extremely thin incrustation on a piece of rock; the surface is pilose, owing to the projection of vertically dressed acanthostyles, each surrounded by tufts of ectosomal spicules. The other, which incrusts the branch of a Polyzoon, is thicker, and the surface here is partly smooth, partly provided with minute sharp-pointed conules supported by acanthostyles. The colour of both specimens is reddish brown.

The *skeleton* in the very thin incrustation at first sight resembles that of a *Hymerrhaphia*; each vertical acanthostyle is isolated and with its head on the base and its pointed end projecting. In the thicker specimen it is possible to make out primary and secondary lines of skeletal fibres.

The ectosomal spicules are partly arranged in paniculate tufts, partly lying tangentially in the dermal membrane.

Spicules.—Megasccleres: choanosomal acanthostyles, $468 \times 23.5 \mu$, curved, spined at the head only, with subornate points. Ectosomal strongyles, $238 \times 4.6 \mu$, straight, smooth, cylindrical, usually with a pointed mucro at one end.

Microsccleres: arcuate isochelæ, 19.5μ long, 5.6μ broad, palmate tooth 8μ long, ovoid, with rounded distal edge; with thick curved shaft; with tongue-shaped alæ about 8μ long.

Isancoræ unguiferæ, 15.3μ long, with slender, curved, sometimes wavy shaft, with three sharp claw-like teeth at each end.

Chelate bipocilla 8μ long, with deeply curved shaft with spatulate ends each with three triangular denticles; these spicules are fairly common and not accidental.

There are also several isochelæ arcuatæ in which the alæ and denticle are replaced at one end by a spoon-like lamella.

The presence in *Myxilla* of chelate bipocilla similar in many respects to those found in the new species *Iophon spatulatus* and *I. flabello-digitatus* is exceptional. In other respects the spiculation is that of a typical *Myxilla*. The isochelæ arcuatæ, though only half the length, resemble in shape those of *Myxilla nobilis*, R. & D., from off the Rio de la Plata, and *M. digitata*, R. & D., from the Cape of Good Hope. The new species, again, closely resembles *Myxilla iophonoides*, Swartzewsky (Mém. Soc. Nat. Kieff, xx. p. 340,

pl. xi. fig. 7, and pl. xv. fig. 27), from the White Sea; but, in addition to other differences, the latter species has no *isochelæ arcuatæ*.

Localities. Winter Quarters, 125 fath.; off Balleney I., 254 fath.

Tedania variolosa, sp. n.

Sponge in form of a mass of thick flabellate or digitate fronds arising from a common base; with circular sphinctrate oscules, each about 1 cm. in diameter, situated at the summits or along the upper edges of the branches, the canals into which they lead extending nearly to the base of the branches. General surface of the sponge covered with circular pore-areas each about 4 mm. in diameter, the oval or circular pores being about $90\ \mu$ in diameter, and the strands of the poral reticulum about $30\ \mu$ in breadth. Colour in spirit pale brown. Consistence soft and fleshy, being easily torn.

Flagellated chambers, $42 \times 35\ \mu$, oval, aphodal, with aphodus (in a measured example) $13\ \mu$ long.

Skeleton.—Choanosomal skeleton formed of loosely agglomerated compound, longitudinal, or main bundles about 1 mm. in diameter, curving out to the surface as they pass upwards; the separate fibres of the main bundles about $80\ \mu$ thick. The main bundles joined at right angles by secondary fibres 1–3 spicules thick. Spongin not perceptible. Ectosomal skeleton formed of circles of strongyles, the spicules isolated or in fan-like wisps, arranged partly vertically, partly tangentially, round the pore-areas; the vertical spicules usually isolated and the tangential ones in wisps. On drying the sponge the edges of the pore-areas stand up sharply, the areas themselves sinking in, giving a pock-marked aspect to the surface.

Spicules.—Megascleres: choanosomal styles, $402 \times 13\ \mu$, curved at about one fourth of the length from the round end, smooth, but occasionally with a few spines about the head. Ectosomal strongyles, $261 \times 6.5\ \mu$, smooth, occasionally slightly swollen at each end.

Microscleres none.

The single specimen is in the form of a squarish mass of thick fleshy flabello-palmate or digitate lobes; the height is 18 cm. and the breadth 13 cm.

The arrangement of the pores in circular areas each surrounded by a zone of ectosomal spicules is not common in *Tedania*; it occurs in the second new species described below, and something of the kind is found in *Tedania tenuicapitata*, Ridley, from the Straits of Magellan. In the present species

this feature is so well marked as to give the surface a pock-marked appearance.

The rhabdides, usually so characteristic of *Tedania*, have entirely disappeared.

Locality. Winter Quarters, 10 fath.

Tedania coulmani, sp. n.

The single specimen is in the form of a finger-like fragment 5.5 cm. long and 1.7 cm. in its greatest thickness. The colour is dirty grey and the consistence soft. The surface shows the same circular pore-sieve areas as in *T. variolosa*. Along one side of the sponge the surface has been torn away, exposing an exhalant canal running along the length of the specimen, but apparently the terminal oscule has been torn away.

Skeleton.—Rings of spicules, partly vertical, partly tangential, isolated or in tufts, surround the pore-areas.

The choanosomal skeleton is formed of primary longitudinal fibres about 120 μ thick, joined by secondary fibres one spicule in length and two to three in thickness, joining the former at right angles.

Spicules.—Megascleres: the choanosomal acanthostyles, $475 \times 18 \mu$, curved, smooth, or with sparse spines, usually on the upper and lower thirds of the length.

Dermal ectosomal tornotes, $319 \times 12.5 \mu$, smooth, straight, fusiform, larger at one end than the other. Under a high power each end shows a rounded shoulder prolonged into a mucronate spine.

Microscleres absent.

The present species resembles *T. variolosa* in having the circular pore-areas, and in the absence of rhabdides, but differs widely in the character of the dermal tornotes. Both species differ from all other species of *Tedania* in having no microscleres. The nearest species to the present one are *Tedania tenuicapitata*, Ridley, from the Straits of Magellan, and *Trachytedania spinata*, Ridley, from the same locality; both of these have rhabdides, and neither has the circular pore-areas, though in *T. tenuicapitata* there is a tendency to a radial arrangement of bundles of dermal spicules. The spination of the acanthostyles recalls a similar character in *Trachytedania spinata*.

Locality. Coulman I., 100 fath.

Mycale acerata, sp. n.

Sponge large, massive, with numerous small rounded

mammillæ; surface finely reticulate and finely hispid. Colour creamy white in spirit. Consistence soft, the tissues being easily torn. The flesh reddish (but soon decolorized), and showing the glistening white strands of the skeleton.

Oscules in form of wide, thin-walled, cylindrical chimneys with rather jagged upper edges, about 1 cm. in height and 1-2 cm. in diameter.

Skeleton.—Ectosomal: a network of triangular meshes formed by bundles of oxeas, the strands being about .35 mm. thick and the meshes about .5 mm. across. Main skeleton formed of long thick anastomosing fibres, which attenuate gradually from 1.5 mm. in thickness and break up a little below the surface into panicles of much finer fibres, which support the dermal membrane and penetrate the strands and nodes of the dermal reticulum, giving rise to a finely hispid condition of the surface. Parallel groups of oxeas scattered in the choanosome.

Spicules.—Megascleres: oxeas, 850×16 25 μ , slightly curved, rather abruptly pointed at one end and more tapering at the other. These oxeas form the fibres and also are gathered into bundles, one spicule in length, of parallel oxeas, scattered in the choanosome.

Microscleres: large anisochelæ palmatæ, 105×50 μ , separate or in rosettes, usually with an angular bend in the shaft; with a triangular upper tooth 60 μ long, about the same length as the upper alæ, which latter are very wide. With the lower tooth oblong, 12.8 μ high, with a slightly convex edge; in one of the specimens this edge is produced into a denticle.

A smaller kind of anisochelæ palmatæ, 47 μ long and 17 μ broad, at the upper end, with a long oval tooth 20 μ long extending below the alæ.

Trichodragmata, 62×12 μ , the trichites being very fine, sharply pointed oxeas.

There are three fine specimens of this species, the largest forming a thick flabellate body 17 cm. high, 11 cm. broad, and 7 cm. thick.

The mammillæ are on an average about .75 cm. in height, and 1 cm. in diameter at the base. The new species bears a very close resemblance to *Mycale magellanica*, Ridley, which likewise has a mammillated, finely reticulate surface and glistening skeletal fibres, but here the surface is smooth and not hispid, and the megascleres are styles, or substyles, such as are normally found in the genus *Mycale*. The microscleres also are different in the two species.

A second species of *Mycale* with oxeate megascleres is

Mycale intermedia (O. Sch.), from East Greenland, noticed by Thiele. The Arctic specimen consisted only of a fragment; but the spicules, which are all considerably smaller than in the Antarctic species, have the following dimensions:—Oxeas $4.0\ \mu$ long, $10\text{--}12\ \mu$ thick; large anisocheles $50\text{--}60\ \mu$ long; small anisocheles $18\ \mu$ long.

Locality. Winter Quarters, 25–178 fath.

Desmacidon mæandrina, sp. n.

The material consists of three subcylindrical fragments tapering at the distal end.

The consistence is hard and dense. The colour in spirit is dirty brownish grey.

The surface is fairly uniformly level, and presents flattened papillæ or meandrine ridges, slightly roughened at the top by projecting oxeas (best seen on side view with a lens).

The dermal membrane roofs over the grooves and spaces between the papillæ and ridges. The pores are mostly circular and about $95\ \mu$ in diameter.

The small circular oscules, numerous and scattered, are about 1 mm. in diameter. The skeleton is formed of a thick, main axis, consisting of rather loose longitudinal strands; from this are given off at right angles cylindrical or lamellar bundles of loose strands, which proceed to the surface and form the papillæ and ridges.

Spicules.—Megascleres: oxeas, $579 \times 39\ \mu$, curved (usually) or bent at the centre, with sharp, pointed ends. Microscleres: isancoræ unguiferæ, $26\ \mu$ long and $15.8\ \mu$ broad; shaft strongly curved and $3.52\ \mu$ thick; with usually five teeth or claws, about $5.28\ \mu$ long, at each end, viz. a central, single, and two lateral bifurcated teeth.

The largest of the three pieces of this sponge is 6.2 cm. long and 16 mm. in diameter. The fragments appear to be broken off from some branched specimen, and I shall refer to them as branches. They are subcylindrical, being slightly compressed in one plane. The chamber system is aphodal, the flagellated chambers ($44 \times 29\ \mu$) being pyriform. There is a considerable amount of variation in the teeth of the isancoræ, the number varying from three to six, the most usual number being five.

In some respects the new species resembles *Desmacidon* (?) *ramosa* (R. & D.), obtained by the 'Challenger' from the Cape of Good Hope and Marion Island. In both species there is a central axis of longitudinal fibres, whence fibres proceed to the surface at right angles. In the 'Challenger'

species the radiate bundles branch in a fan-like manner, finally forming an almost uniform surface layer of vertical oxeas. The microscлерes in *D. (?) ramosa* are isochelæ arcuatæ.

Locality. Coulman I., 100 fath.

Desmacidon spinigera, sp. n.

Sponge digitiform or knob-like; surface coarsely spinous. Consistence rather hard. Colour pale red. Several small oscules about 2 mm. in diameter.

Dermal membrane spread like a delicate net between the spines, and at some distance from the floors of the subdermal spaces. Flagellated chambers oval, $46 \times 32 \mu$.

Skeleton formed of coarse, longitudinal main strands, about 180μ thick, radiating out to the surface, with loose scattered spicules between, united in horizontal bundles only beneath the surface.

Spicules.—Megascleres: oxeas, $731 \times 26 \mu$, curved at centre, mostly subtorotate, though some attenuate gradually, with sharp pointed ends.

Microscлерes of one kind, viz. isochelæ palmatæ, 24.64μ long and 5.28μ broad, on side view; pointed at each end, with straight axis; with palmate teeth 8.8μ long, and with narrow alæ 8.8μ long.

Four specimens were obtained. The type specimen from No. 10 hole, 130 fath., is digitate, 7.5 cm. in length and 2 cm. in diameter. The spines are 2–5 cm. long, those at the lower end pointing obliquely upwards, but above becoming vertical to the long axis.

This species bears much resemblance to *Desmacidon setifer*, Topsent, obtained by the 'Belgica' from the Atlantic. The isochelæ are of much the same character, but those of *D. setifer* are very much larger, viz. $75\text{--}100 \mu$ by $18\text{--}20 \mu$. Further, the consistence of the latter is soft, the colour yellowish in spirit, and the surface hispidation much finer.

Localities. Winter Quarters, 20–130 fath.; Coulman I., 100 fath.

Joyeuxia Belli *, sp. n.

Sponge attached, ovoid, with a thick rind enclosing a soft pulp; with short conical osular, and long trumpet-shaped poral papillæ. Surface finely pilose. Colour of surface yellow, of the rind whitish, and of the pith deep yellow.

* Named in honour of Emeritus Professor F. J. Bell, of the Zoological Department of the Natural History Museum, and editor of the "Reports on the Natural History Collections" brought home by the 'Discovery' from the Antarctic.

Flagellated chambers $23 \times 20 \mu$; diploidal.

Skeleton.—Cortical skeleton formed of layers of strongyles crossing each other at right angles. The walls of the oscular and poral papillæ supported by a layer of longitudinal strongyles. The surface of the sponge hirsute, with a fine pile of strongyles standing out at right angles or obliquely. Choanosome without spicules.

Spicules.—Slightly flexuous smooth strongyles 850μ long, 10μ in diameter at the ends, and 13μ in diameter at the centre.

There is one adult specimen 5 cm. long, 3.5 cm. broad, and 3 cm. thick, with a deep groove on the under aspect, by which it was probably attached to a worm-tube or stem of a hydroid. There is also a small conical specimen, 6 mm. high, attached to a piece of rock.

I was at first disposed to regard this remarkable species as a member of a new genus, partly on account of its very thick rind, which is in places over a millimetre in thickness, and partly because of the highly specialized poral papillæ; but apart from these characters, the new form evidently shows the closest affinities to *Joyeuxia*. The three hitherto described species all have a rind enclosing a soft pulp, the latter being without or almost without a skeleton; then, too, the pulp is highly coloured. *Joyeuxia tubulosa*, Topsent, and *J. ascidioides* (Fristedt) have fistulæ, which, however, appear to be oscular. Two of the species, *J. viridis* and *J. tubulosa*, have strongyles; *J. ascidioides* has tyles and also chelæ. Accordingly Topsent places the genus near *Desmacidon*.

The poral papillæ attain a height of 1 to 1.2 cm.; they are expanded at the end.

The inconspicuous oscular papillæ are only about 4 mm. high and are tightly contracted.

Locality. Winter Quarters, 10–20 fath.

CERCIDOCHELA *, gen. nov.

Mycalinæ with peculiar shuttle-shaped chelæ or canono-chelæ †, with the single tooth from each end fused, and with a semicircular vertical lamella extending inwards from the shaft and from the dental bridge, so as to nearly meet.

Cercidochela Lankesteri ‡, sp. n.

Sponge elongated, slender, fusiform. Colour white; consistence soft. Surface smooth to the naked eye, but finely

* *κερκis*, *ίδος*, a shuttle.

† *κανών*, *όνος*, a shuttle.

‡ Named in honour of Professor Sir E. Ray Lankester, K.C.B., F.R.S.

hispid under a lens. With several small scattered oscules, about 1 mm. in diameter, level with the surface. Flagellated chambers aphodal, oval, $31 \times 21 \mu$.

Skeleton formed of long longitudinal lines of spicule-fibres about 100μ thick, not forming a definite central axis, radiating out in plumose manner to the surface; with a few isolated spicules arranged in a scalariform manner at right angles to main fibres. Spongin not perceptible.

Spicules.—Megascleres: oxeas, $452 \times 19.5 \mu$, curved at centre, attenuating gradually to sharp points slightly planed away on inner aspect. Microscleres: canonochele, somewhat shuttle-shaped, 45.5μ long by 22.75μ broad, with the two teeth fused to form a bridge, and with a semicircular lamella passing upwards from the shaft and downwards from the dental bridge, both lamellæ being nearly on the same plane and nearly meeting, the lamellæ sometimes with basal tubercles. Developmental forms in shape of thin, oval, linear bodies, the oval at first not being complete.

The unique specimen representing the new genus and species is 12.5 cm. long and 1 cm. in breadth at the centre. The body attenuates to fine ends, and apparently has not been attached to anything.

The remarkable canonochele recall to mind the sphærancoreæ of *Melonanchora*, but the latter spicules have three pairs of fused teeth.

The canonochele are scattered about in the choanosome in considerable numbers. The shape may be compared with an oval basin with the bottom cut out, and with two semicircular lids or lamellæ passing horizontally from the upper edge of the basin, so as to nearly meet; further, it is necessary to imagine such a basin turned up on its side.

The earliest developmental forms have an elongated C-shape; then the open C becomes a closed oval; by this time the falx at each end is perceptible, and the beginnings of the lamellæ appear. A further change leads to a marked asymmetry, the thin oval ring becoming a broad band by widening in a direction away from the edges whence the lamellæ arise.

Locality. Winter Quarters, 130 fath.

HOPLAKITHARA *, gen. nov.

Mycaline possessing exotyles with large spherical spined heads and with fimbriated placocheles.

* ὅπλα (pl. of ὅπλος), armour; κιθάρα, a guitar.

Hoplakithara Dendyi *.

Sponge in form of a small cushion, attached by a narrow base. Surface smooth to the naked eye. Colour pale brown in spirit. Consistence, hard externally, soft within. Flagellated chambers $32.5\ \mu$ in diameter, spheroidal, eurypylous.

Skeleton with protective armour formed by gigantic spheroidal heads of exotyles, the exotyles being arranged as radiating bundles in form of inverted cones, with the apices a little below the cortex; with scattered strongyles.

Spicules.—Megascleres: exotyles, with the heads a little inclined to the long axis of the spicule, the proximal end (in the interior of the sponge) rounded, the distal end swollen into large spherical heads, with short cylindrical spines covering the distal three-fourths of the head. Total length $358\ \mu$, the shaft enlarging in diameter from $6.5\ \mu$ at the proximal end to $16\ \mu$ just below the head. Head $55\ \mu$ in diameter; cylindrical denticles 1.76 to $3.52\ \mu$ in height, with finely denticulate edge, and with cup-like depression at the summit.

Strongyles straight, fusiform, smooth, $467.5\ \mu$ long, $9.75\ \mu$ in diameter at centre, $6.5\ \mu$ in diameter at ends.

Microscleres: placochelae, fimbriated, $84.5\ \mu$ long, $29.25\ \mu$ broad; length of tooth $37.75\ \mu$.

Sigmata very small, slender, C-shaped, $8.8\ \mu$ long, $5.28\ \mu$ broad, $.9\ \mu$ thick.

The minute spheroidal or cushion-shaped specimen was 2.2 mm. in height and 3 mm. in horizontal diameter; it was growing on the side of an Alcyonarian creeping over a branched *Cellepora*. No pores or oscules were discernible. The under surface, which was narrowed to the point of attachment, was paler in colour than the upper.

The new genus is closely related to the Mycaline genera *Rhaphidotheca* and *Guitarra*, to the former by its exotyles, and to the latter by its fimbriated placochelae.

The distal knobs of the exotyles of *R. Marshall-Hallii*, Kent, $49\ \mu$ in diameter, are smooth and spherical, and those of *R. rhopalophora*, Schmidt (*R. affinis*, Carter), are $104\ \mu$ long and $30\ \mu$ broad, and club-shaped. Lundbeck regards these two species as probably identical, and certainly the differences are slight.

Locality. Winter Quarters, 130 fath.

Gellius fimbriatus, sp. n.

Sponge in form of a thick triangular cake, or conico-cylindrical. Texture soft, easily broken. Colour in spirit pale buff.

* Named in honour of Professor Dr. A. Dendy.

Surface level, or almost imperceptibly hispid; showing through the dermal membrane a somewhat areolated pattern, each areola being formed by the end of a main fibre giving off fimbriated twigs which roof over the subdermal spaces between the main fibres. A few circular oscules about 5 mm. in diameter, and with slightly raised rims, occur.

Skeleton formed of longitudinal lines of flat, loose, band-like main fibres, with an irregular and obscure reticulation of single spicules between. The main fibres spread out in a paniculate manner a little below the dermal membrane.

Spicules.—Megascleres: oxeas $537 \times 16.25 \mu$, slightly bent or curved at centre, attenuating gradually to sharp points.

Sigmata varying in size, the largest being 40μ long, 17.6μ broad, and 1.76μ thick, with one or more angular bends in the curve, usually one end of the shaft with an angular bend, the other end curved.

The specimen selected as the type of this species has a flattened angular pad-like body, 10 cm. long, 4.5 cm. broad, and 2.5 cm. thick; it apparently lay free on the bottom.

An "areola" with its central node (the end of the main fibre) and lateral branchlets occupies on an average an area of 6×4 mm.

The upper surface alone shows the areolated appearance below the dermal membrane, the under surface being nearly opaque.

The triangular cushion-like shape of the type calls to mind *Gellius flagellifer* (R. & D.), but there are no flagellate sigmata in the new species. *G. rudis* (Topsent) has a much firmer and denser structure, the oxeas are shorter, thicker, and with tornote ends, and the sigmata are more slender and with uniform curve.

The ends of the main fibres are arranged in linear series.

The dermal membrane is separated about 3 mm. from the floors of the large subdermal spaces, and the band-like supporting pillars are about 2 mm. broad. A vertical section gives the appearance of a miniature "hall of a thousand columns." The dermal membrane on the under surface of the sponge contains scattered oxeas arranged tangentially.

Localities. Winter Quarters, 12–20 fath.; Coulman I., 100 fath.

Gellius pilosus, sp. n.

Sponge in form of an erect flattened triangular or elongate lamella divided or digitate at the upper edge. Consistence soft, fleshy, compressible.

Colour in spirit dirty white or very pale yellow.

Surface finely conulose and pilose, owing to the projection of the ends of the main skeleton-fibres about 1 mm., the conules being about .6 mm. apart from each other.

A few oscules, about 1 mm. in diameter, on a level with the surface.

Skeleton formed of slender main axial fibres on an average about 2-5 spicules thick, curving out to the surface, where they form the pile, and of secondary fibres, usually one, but sometimes two or three spicules thick, at right angles to the main ones, with which they form oblong scalariform meshes. Spongin well developed at the nodes of the network.

Spicules.—Megascleres: oxeas, $537 \times 22.75 \mu$, sharp-pointed, subtornote, a few being distinctly tornote.

Microscleres: sigmata, very abundant both in choanosome and ectosome, C-shaped, $39 \times 16.25 \mu$ in length and breadth and 1.5μ thick.

There are two specimens. One of them is in the form of a triangular lamella dividing into two subterete branches, the total length being 10.5 cm., the breadth 3.5 cm., and the thickness 1 cm. The second specimen is 11 cm. long and 3 cm. broad, with little more than a notch at the upper edge, indicating a division into branches.

The new species bears some resemblance to *Gellius flagellifer*, R. & D., but differs from it in the absence of the peculiar flagellate sigmata. Further, *G. flagellifer* has an even surface, and a dermal skeleton network of spiculo-fibre; but in the new species the secondary fibres, usually not more than one spicule thick, are often not present at or just below the surface.

Locality. Winter Quarters, 25-30 fath.

Gellius cucurbitiformis, sp. n.

Sponge small, free, bulbous, with fistular prolongations. Surface smooth, showing under a lens a fine white reticulum. Colour in spirit pale brown. Consistence rather soft.

Skeleton.—With a distinct dermal layer of irregularly arranged tangential oxeas. Choanosomal skeleton a reticulum (with square or triangular meshes) of spiculo-fibre, the strands 2-3 spicules thick, with a faint indication of main fibres radiating to the surface.

Spicules.—Megascleres: oxeas, $342 \times 9.75 \mu$, slightly curved, subtornote.

Microscleres: sigmata, varying in size, the smallest being about 20μ long, C-shaped, and with uniform curve, and the largest 39μ long, 19.8μ broad, and 1.2μ thick.

There are two small specimens, both of which were found in a tangled mass of débris surrounding a worm-tube. The

larger, the type specimen, consists of a basal bulbous portion, 13 mm. long, 7 mm. broad, and 8 mm. high, from one side of which arises a rather thick-walled fistula 13 mm. high and 5.5 mm. in diameter; at the opposite side is a broken circular area, from which, in all probability, a second fistula arose; lastly, between these two is a small raised knob with a rounded orifice on one side of it. The narrow oscular canal is not central, but along one side of the thick-walled complete fistula.

The second specimen is tubular, with a slightly enlarged solid base, whence arises a fistula; the total length is 2 cm., and diameter .5 cm. No pores are discernible; the subdermal spaces are about .2 mm. in depth.

The eurypylous flagellated chambers are $23\ \mu$ in diameter. Cellules sphéruleuses, 8–9 μ in diameter, are common.

There is no bast-like subdermal layer as in *Oceanapia mollis*, Dendy, and the spicules of the latter are smaller, the oxeas being $200 \times 8\ \mu$, and the sigmata only $16\ \mu$. Lundbeck describes two species of *Gellius* with fistulae, and with a well-developed dermal bark, viz. *G. luridus* and *G. microtoxa*, but both these species have toxa in addition to sigmata.

Locality. Winter Quarters, 25–30 fath.

Oceanapia tantula, sp. n.

The sponge consists of five small fragments of tubes, the longest of which is 8 mm. in length, by 4 mm. in diameter: three of the pieces are hollow, thin-walled, and tubular; the other two are solid. One of the solid pieces seems to belong to the top of a fistula.

The colour is transparent white.

Skeleton.—The dermal layer is composed of a chitinous-looking membrane with strongyles lying tangentially, usually in one layer and densely packed, but sometimes more or less scattered.

The white strands of the loose subdermal reticulum are visible through the surface. They are longitudinal, and only anastomose occasionally. The strands are less than .1 mm. in diameter. They vary in composition; in some parts being composed of strongyles smaller than those of the dermal layer, in other parts of smooth trichodragmata, or again of strongyles, amphityles, and trichodragmata. The pale transparent choanosomal tissues are crowded with small spined raphides.

Spicules.—Megascleres: strongyles, $437 \times 19\ \mu$, slightly fusiform, curved once or sometimes twice. Occasionally one end is pointed, the spicule becoming a style.

Amphityles, $395 \times 7.25\ \mu$, slightly fusiform; heads $13\ \mu$ long, $9.75\ \mu$ broad.

Microscleres: long, smooth rhabdites, separate or in bundles, forming part of the subdermal reticulum, $650 \times 2.5 \mu$.

Short, scattered, spined rhabdites, usually stylote, 162μ long and about 2.5μ broad.

H. V. Wilson describes a species of *Oceanapia*, viz. *O. bacillifera*, with strongyles, but it has sigmata.

Oceanapia (*Phlæodictyon*) *singaporensis* (Carter) has strongyles in the dermal layer, but oxeas as well as strongyles in the skeleton-fibres, and there are no microscleres.

The species of the Gelline genus *Rhaphisia* have oxeas, trichodragmata, and, in one species, toxa; but there are no fistulæ, and there is no subdermal reticulum of spicular fibres.

Locality. Winter Quarters, 130 fath.

Petrosia fistulata, sp. n.

Sponge tubular. Surface smooth, showing the round openings of the inhalant canals about .4 mm. in diameter and close together.

Inner surface of the tube of the sponge finely or rarely coarsely pilose, and showing the round openings of the exhalant canals about 1 mm. in diameter. Colour in spirit pale yellow. Texture firm, but slightly compressible. Eury-pylous flagellated chambers spheroidal, 24.5μ in diameter.

Skeleton formed of main fibres proceeding from the inner to the outer surface, joined by secondary fibres one spicule thick, so as to form obscurely quadrangular or hexagonal tubes about .5 mm. in diameter; ends of spicules cemented with spongin.

Spicules.—Oxeas, $492 \times 24.4 \mu$, bent usually, or curved at centre, subtorotate.

There are four specimens, the two larger being uniformly cylindrical and the smaller ventricose. The largest is 6 cm. long, the diameter being 2.1 cm. and the thickness of the wall 5 mm.

The dermal membrane roofing over the inhalant orifices is usually supported there by two or three single spicules radiating to the centre. The pores are $.95 \mu$ in diameter.

Small embryos about .76 mm. in diameter occur. The new species comes nearest to the species from Kerguelen, which Carter identified as *Thalysias sub-triangularis*, Duch. & Mich., but which Ridley and Dendy regarded as synonymous with *Petrosia similis* (Ridley & Dendy).

The spicules of the Antarctic species are very much larger than those of Carter's, and partly in consequence of this the skeletal network of the latter is much denser from a closer approximation of the fibres.

Localities. Winter Quarters, 25–30 fath.; McMurdo Bay, 96–120 fath.

Reniera Scotti, sp. n.*

Sponge consisting of one or more fistulæ. Texture very soft and easily lacerated. Colour in spirit varying from yellow to pale reddish. Outer surface varying from being finely hispid to having large conules and meandrine ridges. Inner surface of fistulæ very finely hispid in the spaces between the numerous orifices of exhalant canals. Flagellated chambers large, hemispherical, $60 \times 40 \mu$.

Skeleton formed of parallel longitudinal lines of main fibres, about 2–6 spicules thick, curving outwards from the inner to the outer surface, where they pass into the conules and ridges; secondary fibres at right angles to the main ones, one or two spicules thick. The spicules are not closely united, and spongin is only present in very small amounts.

Spicules.—Oxeas, $343 \times 14.6 \mu$, curved or bent at centre, subtorotate.

There are six specimens and fragments. The outward appearance varies greatly according to age and size. In one small specimen the surface is finely hispid, in larger ones conulose, and in very large ones conulated and with high meandrine ridges. The largest specimen (No. 118) is in form of a wide thick-walled tube, 12 cm. high and 6 cm. in diameter, and with walls 1.5 cm. thick, but attenuating towards the rim of the tube. This specimen is incomplete below. The orifice is circular, and within the rim is a diaphragm contracted to a white line.

The surface is covered with large conules and meandrine ridges rising to a height of nearly 1 cm.

The dermal membrane, in the spaces between the conules and ridge, shows as a fine lace-like reticulum, with circular pores 133μ in diameter, and beneath it the orifices (1–1.5 mm. in diameter) of the inhalant canals are visible. The exhalant orifices on the inner wall of the tube are much larger than the inhalant; they vary from 1 to 6 or 7 mm., their edges are smooth and rounded.

The species closely resembles *R. spinosella*, Thiele, from Punta Arenas. In Thiele's species the body is tubular, with conulated surface, and the texture is very soft; but the skeletal framework is irregular, and the oxeas, though similar in form, are much shorter, smaller, and more slender, being only 150–170 μ long and 7–8 μ thick.

Localities. Winter Quarters, 5–100 fath.; off E. end of Ice Barrier, 100 fath.

* This fine species is named after Captain Scott, R.N., the leader of the Expedition.

XL.—*Description of an apparently new Species of Monkey of the Genus Cebus.* By D. G. ELLIOT, D.Sc., F.R.S.E., &c.

Cebus apiculatus, sp. n.

Type locality. La Union, Lower Orinoco. Type in British Museum.

Colour.—*Male.* Face flesh-colour. Black spot on middle of crown extending in a narrow line on to the forehead; rest of head greyish brown, becoming greyish white on forehead and sides in front of ears; scape reddish brown; upper half of back blackish brown; lower half of thighs and root of tail blackish brown, all the hairs tipped with russet, giving this part a reddish appearance; arms to wrist on outer and inner sides pale yellow, the hairs being blackish brown at base and tipped with pale yellow, which becomes the dominant colour; wrists and hands blackish brown; hairs towards shoulders are pale yellow to the roots, the blackish-brown bases appearing at the elbows; legs on outer side pale yellow, becoming reddish below the knees, the hairs being blackish brown tipped with pale yellow to the knees and then tipped with golden; throat yellowish white; chest yellowish brown; rest of underparts dark brown in the centre of body, the hairs pale yellow at base; hands blackish brown, feet black; tail above like thighs until near tip, the hairs being black tipped with pale yellow, tip blackish brown, beneath blackish brown the entire length.

Measurements. Total length about 913 mm.; tail 459 (skin). Skull: total length 91; occipito-nasal length 81; hensel 59; zygomatic width 59; intertemporal width 42; palatal length 32; breadth of brain-case 52; length of nasals 19; length of upper molar series 21; length of mandible 55; length of lower molar series 24.

Type. Adult male. B.M. no. 5. 5. 24. 1. Collected 25th Oct., 1903, by Mr. Klages.

A female from the Guayapo, Lower Orinoco, has much longer hair in front and on sides of head, standing out in the shape of a semicrest; the upper arms are darker, being a yellowish brown; the back is not so conspicuously tipped with yellow and is more red at the rump, as are also the legs; the black of the crown is broader and covers all the back of the head; the tail is like that of the male; all the underparts are blackish brown, only the roots of the hairs on the chest being yellowish white.

Another female from the same locality is much redder above, the hairs tipped with yellow on the sides and with ferruginous on dorsal region and on thighs; middle of head from a point on the forehead to occiput blackish brown; back of neck reddish brown like dorsal region; long hairs on forehead and sides of head pale brown; arms reddish brown, only a little of the pale yellow so conspicuous on the male appearing near the shoulder; forearms, legs, hands, feet, underparts, and tail like in the other female.

These three specimens resemble those of no species with which I am acquainted; the style of coloration is alike in all of them, although the tints vary somewhat from a blackish to a reddish brown. All three are strongly speckled on the lower back, legs, and tail by the light tips of the hairs, but only the male has the very light arms. The hair on the head of the male is short and compressed, but the hair on the head of the females is long, loose, and in the form of a crest standing upright on the forehead and away from the sides of the head. The female last described has the back of the head reddish brown like the neck, while the other has the crown and nape alike, of a blackish-brown colour. In this respect, however, they merely follow the habit of many species of the genus *Cebus*, individuals varying greatly among themselves, even from the same locality, in the pattern exhibited on the crown of the head, as well as in the distribution and variety of tints on various parts of the body.

I am indebted to the courtesy of Mr. Oldfield Thomas, Curator of Mammalogy in the British Museum, for the opportunity of describing the above specimens.

XLI.—*On the Occurrence of Acanthoglossus in British New Guinea.* By OLDFIELD THOMAS.

THE Long-nosed Echidna, *Acanthoglossus** (otherwise *Zaglossus*, still better known as *Proechidna*), has hitherto only been known from the north-western part of New Guinea, whence have come all the examples in the different European museums. Of these Mr. Rothschild possesses, in the Tring

* I do not admit that the name *Acanthoglossus* is preoccupied and rendered invalid by the existence of the earlier *Acanthoglossa*.

Museum, no less than ten skins, divided by him into three subspecies.

It has therefore been with great interest that I have examined a fine example of the genus obtained in British New Guinea by Capt. F. R. Barton, and presented by him to the National Museum. It was brought in to him at Port Moresby by natives, who had obtained it on Mount Victoria, in the Albert Edward range, at an altitude of about 8000 feet.

A comparison of this specimen with those in the British and Tring Museums shows, as might be expected, a certain number of differences, of very much the same character as those that distinguish the three Dutch New Guinea subspecies from each other, as described by Mr. Rothschild.

I therefore propose to form for it a fourth subspecies, and to name it, in honour of its donor,

Acanthoglossus Bruijnii Bartoni, subsp. n.

Fur long and thick, entirely hiding the spines over the whole of the dorsal area, these being visible only on the nape, sides of neck, flanks, back of rump, and caudal region. Limbs densely hairy. No spines on belly. General colour black (not brown) throughout, the head not lighter than the body, and the under surface practically as dark as the upper. The only parts not black are the hands and feet, which are brown, grizzled with whitish. The bases of the hairs of the head are also rather lighter than the tips. Spines thin, short (rarely attaining 30 mm. in length), white, very different to the long, thick, blackish spines of *A. B. nigroaculeatus*.

Skull with rather shorter and more curved beak than that of the specimen measured in the 'Catalogue of Marsupials: Monotremes'; condyloid vacuities present; palatal foramina unusually long.

Dimensions of the type:—

Length of head and body 560 mm.

Skull: basal length 175; greatest breadth 59; palate length 161; anterior palatine foramina 49.

Hab. Mount Victoria, British New Guinea. Alt. 8000'.

Type. Old female. B.M. no. 7. 7. 17. 5. Collected and presented by Capt. F. R. Barton.

BIBLIOGRAPHICAL NOTICES.

I Go A-Walking. Through the Woods. With Illustrations by
CHARLES REID. London: T. N. Foulis, 1907. 2s. 6d.

THIS book, which bears the above barbarous title, justifies its existence only through its illustrations, which are really beautiful. The text, which is merely a compilation of scraps from various second-rate writers, is puerile. W. P. P.

Nature in School.—No. 2. Edited by BORIS WEINBERG, Priv. Doc. St. Petersburg Univ. (Published by I. D. Sitin, Petrovka, Moscow.)

THE appearance of this monthly journal is an interesting sign of the great activity of late years among the Russians with regard to scientific pursuits. We are aware that capable and industrious observers have travelled in regions scarcely known by name, and undergone innumerable difficulties and hardships in order to enrich the annals of exploration and research. Since the days of the great Prjevalsky, for example, colleagues and followers have re-trodden his paths, opened up new ground, and published their records. But while some have worked in the desert and on the seas those at home have not been idle, as the numerous university and society transactions and proceedings abundantly testify. The journal before us is devoted to the encouragement of the study of physics, chemistry, and natural history in middle and elementary schools.

In the natural history section, Mr. N. M. Knipovitch, a well-known authority on marine conditions, continues his examination of the Caspian Sea basin. Referring to plankton, a subject hitherto little studied, his definition is worth reproducing:—

What is this plankton? A rain of corpses, incessantly falling from above in proportion to the death-rate among the animal and vegetable organisms inhabiting in abundance the upper strata of our basin. This rain of corpses does not present any peculiarity exclusively belonging to the Caspian Sea. In any considerable extent of salt and fresh water on the terrestrial sphere the same phenomenon occurs.

Among the Caspian plankton have been found *Chiridotea entomon* and *Cardium edule*, which belong to northern seas and lakes. Next Mr. Knipovitch discusses the herring-fisheries of the Volga and Caspian, and urges that care should be taken by fishing communities to avoid exhaustion and waste of the Volga sources of the important herring industry. Passing to geology, the author traces the changes which have taken place since the Sarmatian Sea extended from the foot of the Alps to Tian-shan, and concludes: "the Caspian Sea may be considered an example of a basin with anomalous physico-geographical and biological conditions." Mr. V. Polovtsov deals with

country excursions. To junior students, names like nightingale, squirrel, hare, &c. are only familiar from the written symbols in school books, and the results of inquiry among Russian and German children are set out in this table:—

| | German. per cent. | Russian. per cent. |
|-------------------------------------|----------------------|-----------------------|
| <i>Children who have not seen :</i> | | |
| Lark rising with song | 25 | 50-60 |
| Squirrels in a wood | 71 | 58-66 |
| Running hare | 3 | 50-54 |
| Mole-hill | 22 | 30-59 |
| Nests on a tree | 15 | 3-11 |
| Snail crawling | 2 | 40-59 |
| <i>Not heard :</i> | | |
| Nightingale's song | 56 | 40-44 |
| Cuckoo's cry | 11 | 20-32 |
| <i>Not visited :</i> | | |
| A leafy forest | 44 | 10-11 |
| One of acerous leaves | 37 | 12-17 |

In other words, about half the children are as if blind or deaf to rural sights and sounds. This leads the writer to exclaim at the expenses during a decade of school life and overwork of brains in order to learn word combinations. This can only be remedied by *teachers*, not merely by programmes. Especial interest attaches to the article by Mr. Sukatshev on the forest as an association, as an object for winter study. The mutual effects of trees on their growth side by side are contrasted with the development of solitary specimens. There is a struggle for life among crowded trees, and the weakest goes to the wall. There are distinctions between simple and complex associations. This article is suggestive of original research and aspects often overlooked. The results of winter zoological explorations round the St. Petersburg Government are given by Mr. S. A. Petrov. The winter habits and colouring of animals and birds are described.

In the department of chemistry, Mr. S. Sozonov continues his examination of a government scheme for chemical instruction in *Realschulen*. He writes: "Dogmatism in an elementary course of chemistry, as of physics, should be reduced to the minimum possible. To eliminate it altogether is unfortunately out of the question at present." Mr. V. Verkhovsky continues his description of heating apparatus for chemical experiments in middle schools, and the study of physics in village and urban schools is treated by Mr. V. Lermantov. "Russian students," observes the latter, "are generally lacking in attention: they understand more easily a serious but short deduction, than a simple but 'many-storied' reasoned conclusion extending over pages." There is a favourable notice of a new German solder-paste, "tinol," made at a Bonn factory.

The remainder of space is occupied by reviews of works on inorganic chemistry and elementary physics.

FRANCIS P. MARCHANT.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 118. OCTOBER 1907.

XLII.—*New South-African Spiders of the Family Drassidæ in the Collection of the South-African Museum.* By W. F. PURCELL, Ph.D., Cape Town.

[Plates XIII.–XV.]

THE spiders of the family Drassidæ are particularly numerous both in species and individuals throughout all the non-tropical parts of South Africa. Only very few South-African species have, however, as yet been described, and the entire collection in the South-African Museum, with the exception of one or two forms, is still new to science. The present paper contains the descriptions of fifty-three new species, being that portion of the Collection pertaining to the genera *Platyoides*, Cambr., *Theuma*, E. Sim., *Drassodes*, Westr., *Scotophæus*, E. Sim., and *Melanophora*, C. Koch, as defined in Simon's Hist. Nat. Araign. 2nd ed., together with two new genera for certain forms which did not seem to fall into any of the genera recognized by Simon. In the present uncertain state of the classification of the Drassidæ all of these genera are to be considered as more or less of a temporary nature. All localities are in Cape Colony, except when otherwise stated.

Genus PLATYOIDES, Cambr.

1. *Platyoides bidentatus*, sp. n.
(Plate XIII. figs. 1 & 2.)

Specimens.—(a) 3 ♀♀ and 1 ♂ from Kentani and
Ann. & Mag. N. Hist. Ser. 7. Vol. xx. 20

District, collected by the Rev. Dr. F. C. Kolbe and Miss Alice Pegler; May.

♀ ♀ (*types*).—*Colour* of carapace and chelicera mahogany-brown; sternum and three basal segments of legs yellow, the sternum with a deep blackish-red border all round, the remaining leg-segments (especially the patellæ) and the apex of each femur more or less infuscated; abdomen blackened above, with or without a longitudinal row of more yellowish areas on each side of the median line, the underside paler, yellowish, whitish, or more or less infuscated.

Carapace longer than broad, its median length equal to that of the tibia and $\frac{2}{5}$ or slightly more of the metatarsus of first leg, its margins with slender spines. Anterior median eyes about a diameter apart, their distance from the anterior laterals about $1\frac{3}{4}$ times their distance from one another. Posterior median eyes obliquely oval, about two long diameters apart and about three from the posterior laterals.

Chelicera with spiniform setæ above, the inner margin with a dense stripe of slender setæ borne on small granules and with 2 rather strong and conspicuous teeth in the stripe.

Legs with spines and spiniform setæ on the basal segments above and with long black setæ on the other segments; tarsi and metatarsi of two anterior pairs with scopula below, that on the first metatarsus extending over the distal half at least, but that on the second confined to the apex of the segment; tibiæ not scopulate.

Vulva as in Pl. XIII. fig. 1; the T-shaped depression with the longitudinal portion finely pointed posteriorly and the transverse portion slightly recurving at each end.

♂.—Very much smaller, being less than half as long as the ♀.

Carapace yellowish, its length as in the ♀; the eyes closer together, the anterior medians at least as close to the laterals as to one another, being an eye's diameter or less from them; the posterior median eyes about a diameter from one another and $1\frac{1}{2}$ diameters from the posterior laterals.

Chelicera toothed as in the ♀.

Pedipalps short; the femur cylindrical, longer than the patella and tibia together, with mesial spine above; the tibia shorter than the patella, with small apical process on upper outer edge; the tarsus strongly convex, ovate, obtusely lobate at base on outer side; palpal organ as in Pl. XIII. fig. 2.

Length of trunk (carapace and abdomen) ♀ ♀ $11\frac{1}{2}$ –12, ♂ $4\frac{2}{3}$, of carapace ♀ $4\frac{3}{4}$, ♂ 2; width of carapace ♀ $4\frac{1}{2}$, ♂ $1\frac{1}{4}$ mm.

(b) 1 ♀ from East London (*J. Wood*).

(c) 2 ♀ ♀ from Port St. Johns, Pondoland (*Guy Shortridge*).

Somewhat resembling *P. Abrahami*, O. P. Cambr., and *P. laterigradus*, Poc., in the form of the vulva, but possessing two strong teeth on the chelicera.

2. *Platyioides quinquedentatus*, sp. n.

(Plate XIII. fig. 3.)

Specimens.—2 ♀ ♀ and 1 young from Swellendam (*H. A. Fry*, 1900).

♀ ♀.—*Colour* of carapace and chelicera dark mahogany-brown; legs similarly coloured or lighter and more yellowish, the anterior pairs more reddish than the posterior ones, all partially infuscated, the femora not paler than the distal segment; abdomen blackened, with a paler, more or less yellowish, longitudinal dorsal stripe on each side above, the ventral surface pale yellowish; sternum reddish yellow.

Carapace as long as the tibia and $\frac{1}{4}$ – $\frac{1}{3}$ of the metatarsus of first leg, the margin with spiniform setæ and slender spines. Anterior median eyes almost a diameter apart and almost two diameters from the laterals, their distance from the latter being double their distance from one another; posterior median eyes almost transversely oval, about $2\frac{1}{2}$ diameters apart and almost 3 diameters from the laterals.

Chelicera with 5 very strong teeth in the distal half of the inner margin, besides the row of setæ; upperside with spiniform setæ.

Legs with spiniform setæ on basal segments, the distal segments with slender setæ; two anterior pairs of tarsi and metatarsi scopulate along whole length below, the first tibia also with tiny apical scopula.

Vulva of two black pear-shaped depressions, appearing (in spirits) as in Pl. XIII. fig. 3.

Length of trunk in ♀ ♀ 11–12½, of carapace 4½–5; width of carapace 4¼–4½ mm.

Genus *THEUMA*, E. Sim.

1. *Theuma capensis*, sp. n.

Specimens.—(a) 10 ♀ ♀, 6 ♂ ♂, and 1 young from the drier slopes of the mountains of the Cape Peninsula, especially the slopes above Camps Bay. ♂ ♂ from September to December.

♀ ♀.—*Colour* yellow, the head, chelicera, tarsi, and metatarsi more rufescent; the abdomen pale yellowish, with yellowish or pale fuscous hairs and darker setæ.

Anterior row of *eyes* scarcely procurved, the medians distinctly smaller than the laterals; posterior row of eyes slightly recurved, the eyes equal, the medians slightly oblique, about a diameter (rarely distinctly less than a diameter) apart and $1\frac{1}{2}$ diameters from the laterals, the latter distinctly a little nearer to the anterior laterals than to the posterior median eyes.

Chelicera with 4-5 superior and only 2 (rarely 3) inferior teeth.

Legs.—Metatarsus I with 1-2 inner and 2 outer inferior spines, narrowly scopulate on each side, but not between the rows of spines below. Tibia I with 4-5 inner and 3-6 outer spines below, not distinctly scopulate or at most with a few scopulate hairs along the rows of spines.

Vulva-plate longer than wide, the triangular fovea wide behind, narrowed in front.

Inferior spinners relatively short, the length of the basal segment taken below a little less than the width of the ocular area.

♂♂.—*Legs* longer; metatarsus I with 2 inner and 3 outer spines below; tibia I with 4 pairs of inferior spines and sometimes with an inner lateral spine as well.

Inferior spinners longer, the length of the basal segments exceeding the width of the ocular area.

Tibia of *pedipalps* short and thick, its outer process longer than the segment and suddenly deflexed at apex. Tarsus with a short curved process near the middle of the outer edge.

Length of trunk (carapace and abdomen), ♀♀ 5-7, ♂♂ $4\frac{1}{2}$ -5 mm.

A variety of this form with four minute teeth instead of two on the inferior inner margin of the chelicera is represented by the following specimens:—

(b) 1 ♂ from Ceres (*W. F. P.*).

(c) 1 ♀ from near Tulbagh Road Station (*W. F. P.*).

(d) 1 ♀ from Caledon.

2. *Theuma fusca*, sp. n.

Specimens.—(a) 6 ♀♀ from the Montagu Baths, a number of young from Kogmans Kloof, and 2 ♂♂ from Aston, Robertson Div., all found by my wife and myself.

♀♀.—*Colour* ochraceous, head and chelicera rufescent; abdomen pale yellowish below, densely clothed above with infuscated hairs.

Anterior row of *eyes* slightly procurved, the laterals very

distinctly larger than the medians; posterior row more strongly recurved than in *T. capensis*, sp. n., the medians smaller than the anterior laterals, rotund, about a diameter (rarely less) apart and less than two diameters from the laterals, the latter eyes perhaps a trifle larger than the medians and about as far from them as from the anterior laterals.

Chelicera with 3 larger and 1 small superior and 3-4 inferior teeth.

Metatarsus I with 1-2 inner and 2 (rarely 1) outer spines; *tibia* I with 3 pairs of inferior spines (including an apical pair) and sometimes with another internal spine as well.

Vulva-plate with the triangular fovea wider behind, its anterior end opening into a small circular fovea.

Inferior spinners long, the length of the basal segment much exceeding the width of the ocular area (except in one specimen where the spinners were perhaps damaged in youth).

♂ ♂.—Legs much longer than in the ♀ ♀ and more numerous spined. *Metatarsus* I with 4 strong spines. *Tibia* I with 0-1 outer and 1-3 inner spines in addition to the 3 inferior pairs. Posterior median eyes sometimes less than a diameter apart. Hairs on abdomen rubbed off. Pedipalps as in *T. capensis*, sp. n.

Length of trunk, ♀ ♀ $8\frac{3}{4}$ -11, ♂ ♂ $6\frac{3}{4}$ - $7\frac{3}{4}$ mm.

(b) 2 ♂ ♂ and 1 young from Bergvliet, Cape Peninsula (W. F. P.).

3. *Theuma Schreineri*, sp. n.

Specimens.—2 ♀ ♀ and 5 ♂ ♂ from Hanover (S. C. Cronwright Schreiner, September to November 1901, and G. Shortridge, 1903).

Differing from *T. fusca*, sp. n., as follows:—

♀ ♀.—Hairs on *abdomen* paler, brownish.

Posterior row of *eyes* straighter, only very slightly recurved; the eyes subequal, the lateral eyes distinctly a little nearer to the anterior laterals than to the posterior median eyes.

Chelicera with 4-5 superior teeth, the proximal one small.

Tibia I with 3-4 pairs of non-apical and 0-2 apical spines below, and frequently with 1-2 outer and 1-2 inner spines on the sides as well.

♂ ♂.—*Metatarsus* I with 5-7 spines. *Tibia* I with 5-6 pairs of spines below, besides 2 outer and 2-4 inner spines on the sides.

Length of trunk, ♀ ♀ 7- $8\frac{1}{2}$, ♂ ♂ $6\frac{1}{2}$ -8 mm.

Another ♀ from the same place and apparently belonging to the same species is much larger, its carapace alone measuring $4\frac{3}{4}$ mm. in length.

4. *Theuma maculata*, sp. n.

Specimens.—2 ♀ ♀ (one not quite mature), 1 ♂, and 1 juv. from Beaufort West (*W. F. P.*, September 1896).

♀ ♀ (*types*).—*Colour* yellow, the abdomen pale yellow below, spotted with black on the sides; the upper surface with a broad irregular band of black on each side and a narrow median black stripe, connected with the lateral bands by a series of oblique black stripes.

Anterior row of *eyes* very distinctly procurved, the laterals very distinctly larger than the small medians; posterior row distinctly recurved, the median eyes almost rotundate and rather large, considerably larger than the anterior medians, and nearly as large as the anterior laterals, their distance apart distinctly less than a diameter, the lateral eyes equidistant from the medians and anterior laterals.

Chelicera with 3 large and 1 small superior and 3-4 inferior teeth.

Spines of *legs*, *vulva*, and *spinners* much as in the *T. fusca*, sp. n.

♂.—Like that of *T. fusca*, apart from the ocular characters, except that the tibia of the pedipalps is much more elongate, being distinctly longer along the inner side than thick, its length equalling that of the outer process.

Length of ♀ 7, ♂ $7\frac{1}{2}$ mm.

5. *Theuma cedri*, sp. n.

1 ♀ from Boschkloof Waterfall, Cedar Mountains, Clanwilliam Division (*R. Pattison*, November 1897).

Colour yellow; the head, chelicera, and extremities of the legs rufescent; abdomen pale yellow, the upperside clothed with dark hairs, which form spots posteriorly (the hairs rubbed off in the middle, but probably arranged as in *T. maculata*, sp. n.).

Eyes and *spinners* much as in *T. maculata*.

Metatarsus I with 4 strong spines. *Tibia* I with 3 pairs of inferior spines (including an apical pair) and 2 internal spines in addition.

Chelicera with 3 superior and 3 inferior teeth, the latter stronger than usual.

Vulva-plate with the fovea elongate and narrow behind.

Length 9 mm.

6. *Theuma mutica*, sp. n.

1 ♀ found at Kogmans Kloof, Robertson Division, in August 1900, by my wife.

Colour.—Carapace more or less infuscated, darkest at the lateral margins, paler and yellowish along the middle of anterior half and along posterior border. Chelicera and sternum ochraceous. Legs yellowish, faintly infuscated in parts. Abdomen pale yellowish below, deeply infuscated above and at the sides.

Anterior row of *eyes* slightly procurved, the laterals much larger than the medians. Posterior row of *eyes* straight, the medians oval, oblique, very close together, separated by less than half a length, but at least an eye's length from the laterals; these latter scarcely larger than the medians and close to the anterior laterals, being less than a diameter from them.

Chelicera with 2 larger proximal and 3 smaller distal teeth in the superior row, and only 1 minute tooth in the inferior row.

Legs with numerous fine small spines scattered irregularly on the under surface, the first leg without any strong spines below; second leg with a strong mesial spine on tibia; third and especially fourth leg strongly spined on underside as well as on upper.

Vulva-plate broader than long, consisting of a pair of oval reddish disks separated by a narrow triangular fovea.

Inferior spinners long.

Length $4\frac{1}{2}$ mm.

A very distinct species.

7. *Theuma parva*, sp. n.

1 ♂ from Eierfontein, 8–9 miles west of Hanover (*S. C. Cronwright Schreiner*, January 1902).

Colour very pale yellowish.

Anterior row of *eyes* slightly procurved, the medians a little smaller than and touching the laterals, but a little separated from each other. Posterior row of *eyes* straight (scarcely recurved at all), the subrotund median eyes comparatively large, being larger than the laterals and at least as large as the anterior laterals, their distance from one another less than an eye's diameter and slightly greater than their distance from the posterior laterals, the latter eyes about as far from the anterior laterals as from the posterior medians.

Chelicera with 4 superior and 3 smaller inferior teeth.

Legs.—Metatarsus I with 3 long spines at base. Tibia I with 3 pairs of inferior spines (including an apical pair).

Pedipalps very like those of *T. capensis*, sp. n., except that the bulb is relatively much larger than in any of the foregoing species.

Inferior spinners shortish, their length only just exceeding the width of the ocular area.

Length of carapace and abdomen $3\frac{3}{4}$ mm.

A very distinct species.

*Table of the Species of Theuma * described above.*

- a. Posterior row of eyes straight, the medians being a little nearer to the laterals than to one another. (Hanover Div.) ♂ *T. parva*, sp. n.
- b. Posterior row of eyes more or less recurved, the medians always nearer to each other than to the lateral eyes.
 - a². Posterior row of eyes only slightly recurved, the laterals being distinctly a little nearer to the anterior laterals than to the posterior median eyes.
 - a³. Females.
 - a⁴. Inferior spinners shortish, the length of the basal segment taken below being less than the width of the posterior row of eyes. (Cape, Tulbagh, and Caledon Divs.) ♀ *T. capensis*, sp. n.
 - b⁴. Inferior spinners long.
 - a⁵. Anterior pair of legs strongly spined below. (Hanover.) ♀ *T. Schreineri*, sp. n.
 - b⁵. Anterior pair of legs with no strong spines below. (Robertson Div.) ♀ *T. mutica*, sp. n.
 - b³. Males.
 - a⁶. Tibia I with 4 pairs of spines below. (Cape and Ceres Divs.) ♂ *T. capensis*, sp. n.
 - b⁶. Tibia I with 3 pairs of spines below. (Hanover.) ♂ *T. Schreineri*, sp. n.
- b². Posterior row of eyes more strongly recurved, the laterals being about as far from the anterior laterals as from the posterior median eyes.
 - a⁷. ♀ with the posterior median eyes smaller, about a diameter apart. ♂ with the outer process of the tibia of pedipalps much longer than the short tibia. (Robertson and Cape Divs.) .. ♂ ♀ *T. fusca*, sp. n.

* Two other South-African species, *T. xylina* and *T. aprica*, E. Sim., have been described (Hist. Nat. Aragna. 2nd ed. p. 351), but no locality is given in either case.

- b⁷. ♀ with the posterior median eyes largish, less than a diameter apart.
 ♂ with the outer process of the tibia of pedipalps about as long as the rather elongate tibia.
 a⁸. Vulva of ♀ with the fovea widened behind. (Beaufort West.) ♂ ♀ *T. maculata*, sp. n.
 b⁸. Vulva with the fovea narrow behind. (Clanwilliam Div.) ♀ *T. cedri*, sp. n.

Genus DRASSODES, Westr.

1. *Drassodes lophognathus*, sp. n.
 (Pl. XIII. figs. 4-6.)

Specimens.—(a) 5 ♀ ♀, 4 ♂ ♂, and 7 young from the north-western slopes of the Devil's Peak, Cape Town, under stones (*W. F. P.*).

♀ ♀ (*types*). *Colour*.—Carapace pale ochraceous, the head often darker brown; chelicera ochraceous to brown; legs pale yellow, the femora very pale, the anterior pairs of legs often brownish yellow distally; sternum pale ochraceous to brownish yellow; abdomen pale yellowish, the upper surface and the posterior part of the sides marked with numerous short black bars and round spots, the anterior half also with a broad, wedge-shaped, median black band, the under surface and the sides pale yellow or more or less infuscated.

Carapace broad in front, the width of the head across the second line of eyes being at least $\frac{2}{3}$ of the greatest width of the carapace.

Eyes.—Anterior row considerably procurved, the eyes subequal; the posterior row lightly procurved, the median eyes elongate oval or triquetrous, subcontiguous or as much as half a long diameter apart, and almost or quite a long diameter from the smaller lateral eyes. Median eye-area longer than wide and parallel-sided.

Chelicera with the two inferior teeth of moderate size, the distal one being usually a trifle smaller; middle superior tooth very strong, the other two superior teeth small.

Legs.—Metatarsus I with 0-2 inferior basal spines. Tibia I unspined, IV without dorsal spines. Tarsi I-III and metatarsi I-II distinctly scopulate at the sides below; tarsus IV and metatarsus III with narrow strip of scopular hairs, the fourth metatarsus with a few external scopular hairs in some specimens at least.

Vulva-plate (Pl. XIII. fig. 6) very large, consisting of a brown, horseshoe-shaped curved rim enclosing a large deep

cavity, which is divided longitudinally by a broad, pallid, wedge-shaped keel, dilated anteriorly to form a T; hind part of the rim with a pair of dark admedian spots.

♂ ♂.—Anterior part of head and the chelicera and other mouth-parts often reddish black, the abdominal spots also generally more sharply marked.

Coxæ of pedipalps strongly depressed, transversely ridged in the middle, the depression bordered on the outer side as well as on the inner by a well-marked keel, which is absent on the outer side in the female.

Chelicera with the inner margin sinuated near the middle and lobate at the base, the superior distal edge of the inner margin with the two proximal teeth fused to form a low keel on which the point of the proximal tooth is usually not distinguishable; this margin also much more oblique distally than in the ♀.

Pedipalps short; the tibia together with its strong superior process longer than the patella, this process broadly and obliquely truncated at apex and slightly sinuated on upper inner margin near apex, the lower edge acute at apex; tarsus large, as long as the patella and tibia together (inclusive of the tibial process), somewhat polygonal in outline (Pl. XIII. fig. 4), the outer edge being slightly sinuated, the inner edge with a few fine spiniform setæ. Palpal organ very large, as in Pl. XIII. fig. 5.

Length of trunk, ♀ ♀ 5½–8, ♂ ♂ 5–6 mm.

(b) Other specimens from the Cape Peninsula (Table Mountain, Camps Bay, Cape Flats, Simonstown). In one of these (a ♀) the chelicera have three inferior and four superior teeth.

(c) 1 ♀ from Stellenbosch (*L. Péringuey*).

(d) 5 ♀ ♀ from the Pass at Avontuur near Stormsvlei, Swellendam Division, collected by my wife and myself.

(e) 1 ♂ and 1 ♀ from St. Helena Bay, Malmesbury Division (*J. E. C. Gould*).

(f) 1 ♂ from Onder Berg Vlei, Clanwilliam Div. (*C. L. Leipoldt*).

(g) 1 ♀ from the Hex River Valley, Worcester Div. (*F. Treleaven*).

(h) 3 ♀ ♀ from Touws River, Worcester Div. (*W. F. P.*).

(i) 3 ♂ ♂ and 7 ♀ ♀ from Matjesfontein, Worcester Div., and

(j) 1 ♂ and 4 ♀ ♀ from Laingsburg, Pr. Albert Div., collected by Mr. R. M. Lightfoot, my wife, and myself.

(k) 1 ♀ from Beaufort West (*W. F. P.*).

(1) 3 ♀ ♀ from Willowmore (*Dr. H. Brauns*).

The T-shaped median ridge of the vulva is normally white in colour, but occasionally it is more or less lightly browned; the posterior part, too, is sometimes broad behind and parallel-sided, instead of being wedge-shaped. The carapace of the ♀ does not exceed $2\frac{1}{2}$ mm. in length in the largest specimen, that of the largest ♂ being slightly less. The anterior lateral eyes are their own diameter or less from the anterior margin of the carapace. The spots on the abdomen are occasionally absent. In some ♂ ♂, notably those from Matjesfontein, the two proximal teeth of the superior margin of the chelicera are less completely fused and separately distinguishable.

The species is closely allied to *D. morosus* (O. P. Cambr.) from Palestine, the figure of whose palp, given by Cambridge (P. Z. S. 1872, pl. xv. fig. 9), almost exactly resembles the palp of *D. lophognathus*, sp. n. In *D. morosus*, however, the eyes of the posterior row are said to be equidistant from each other. *D. omissus* (O. P. Cambr.), from Palestine, has a very similar vulva (P. Z. S. 1872, pl. xv. fig. 17).

2. *Drassodes tessellatus*, sp. n.

(Pl. XIII. figs. 7 & 8.)

Specimens.—(a) 17 ♂ ♂ and 45 ♀ ♀, besides a pair *in copulâ*; also 6 ♀ ♀ with variety of the vulva; all collected at Hanover by Mr. S. C. Cronwright Schreiner in 1901.

Very closely allied to *D. lophognathus*, sp. n., but larger, and differing principally in the form of the proximal tooth on the inner side of the large sigmoid process of the palpal organ, this tooth (which is hidden under the tarsus) forming a broad truncated lobe and much broader than the distal tooth (Pl. XIII. fig. 8).

Colour.—Carapace often rufescent, the head and chelicera red, the legs yellowish or reddish yellow, the abdomen speckled as in *lophognathus*.

Posterior median *eyes* slightly more than an eye's diameter from the laterals, and the anterior lateral eyes generally slightly more than a diameter from the anterior margin of the carapace.

Chelicera of ♂ ♂ with the two proximal teeth on superior inner margin fused to a keel or more or less separate.

Vulva of ♀ ♀ normally resembling that of *lophognathus*, the median T-shaped ridge being generally whitish; often, however, this ridge is browned or reddened, and in the

6 ♀ ♀ mentioned above it is dark brown or black, the transverse cavity in front of it then often with a brown margin, as in Pl. XIII. fig. 7.

Length of trunk in ♀ reaching $10\frac{1}{2}$ mm.; length of carapace in ♀ up to 4 mm.

(b) 1 ♂ and 1 ♀ from Steynsburg Division, Cape Colony (G. G. Ponder).

3. *Drassodes solitarius*, sp. n. (Pl. XIII. fig. 9.)

1 ♀ from Hanover (S. C. Cronwright Schreiner).

Very like *D. tessellatus*, sp. n., but still larger and with somewhat different vulva.

Colour.—Carapace rufescent, the head and chelicera deeper red, legs ochraceous; abdomen pale yellowish, the dorsal spots only faintly marked, the anterior half with a median pale dorsal stripe bordered on each side by a darker stripe.

Anterior median eyes slightly nearer together than in *tessellatus*, their distance apart being scarcely twice their distance from the lateral eyes; posterior median eyes distinctly more than a diameter from the posterior laterals.

Chelicera with all the teeth rather strong, the middle superior tooth very strong.

Vulva as in Pl. XIII. fig. 9, the horseshoe rim being relatively broader and more transverse and with its anterior ends more strongly converging than in the preceding forms.

Length of trunk 10, of carapace $4\frac{1}{2}$ mm.

4. *Drassodes caffrerianus*, sp. n. (Pl. XIII. fig. 10.)

1 ♂ from the Keneha Bridge, about 22 miles west of Maclear, Pondoland (A. S. Weisbecker, August 1903).

Colour pale yellow, with black reticulation and hairs; legs pale yellow, many of the segments faintly infuscated; abdomen black above, the underside yellowish but infuscated; sternum pale yellowish, with black edges. (The specimen, when caught, had evidently but recently moulted, and maturer specimens would probably be much darker.)

Closely allied to *D. lophognathus*, sp. n., but differing principally as follows:—

Chelicera only very feebly sinuated on inner edge, the large tooth of the superior inner margin not keel-like, but erect and conical, and accompanied by a tiny second tooth on its proximal side.

Pedipalps closely resembling those of *lophognathus*, but with different dentition on the medial distal process (Pl. XIII. fig. 10).

Length of trunk $4\frac{1}{5}$ mm.

5. *Drassodes calceatus*, sp. n. (Pl. XIII. fig. 11.)

2 ♀ ♀ from Matjesfontein.

Very like *D. lophognathus*, sp. n., but with the vulva different and shaped as in Pl. XIII. fig. 11.

Length of trunk $5-5\frac{3}{4}$ mm.

The abdomen is much more thickly spotted on the ventral surface than is the case in any of the female specimens of *lophognathus* from the same locality.

6. *Drassodes Gooldi*, sp. n. (Pl. XIII. fig. 12.)

2 ♀ ♀ from Stompneus, St. Helena Bay, Malmesbury Div. (*J. E. C. Goold*).

Closely allied to *D. calceatus*, sp. n., but larger and without the infuscate spots on the abdomen.

Vulva as in Pl. XIII. fig. 12; the anterior margin of the anterior cavity brown, and therefore much more distinct than in *calceatus*, and also more strongly emarginate in the middle.

Length of trunk 8, of carapace $3\frac{1}{4}$ mm.

7. *Drassodes lyratus*, sp. n. (Pl. XIII. fig. 13.)

1 ♀ from Matjesfontein, Worcester Div.

Very like *D. lophognathus*, sp. n., but with the vulva different, as in Pl. XIII. fig. 13.

The abdomen has two fine longitudinal stripes below behind the vulva, but there are no dark spots on the dorsal surface.

Length of trunk $5\frac{1}{2}$ mm.

8. *Drassodes helenæ*, sp. n.
(Pl. XIII. figs. 14 & 14 a.)

1 ♂ from Stompneus, St. Helena Bay, Malmesbury Div. (*J. E. C. Goold*).

Allied to *D. lophognathus*, sp. n., with similar maxillæ, &c., but of larger size and with somewhat different pedipalps.

Carapace rufescent, the head and chelicera blackish red; abdomen numerously spotted above, the under surface without spots.

Anterior legs unspined.

Posterior median eyes large, angular, subcontiguous, and about their own diameter from the laterals.

Pedipalps with the tarsus narrower and symmetrically oval in outline when seen from above, its length almost equalling that of the patella and tibia together (inclusive of the tibial process); surface of the tarsus with slender scattered spines and spiniform setæ, the inner edge with some stronger curved spines, the outer edge convex, not sinuated. Palpal organ also smaller, appearing as in Pl. XIII. fig. 14, when seen from below; the medial distal process of the bulb with simple apex and provided near the middle on the upper surface with a single erect tooth (only seen on lifting the tarsus, as in Pl. XIII. fig. 14 a).

Chelicera with strongly oblique inner distal margin, the upper margin with a strong keel-like tooth remote from the apex, the medial sinus short and deep.

Length of trunk $7\frac{3}{4}$, of carapace $3\frac{3}{4}$ mm.

This may, perhaps, be the ♂ of *D. calceatus*, sp. n., from the same locality, but in the latter the infuscated markings on the abdomen are obsolete, while they are strongly marked in *D. helenæ*.

9. *Drassodes Dregei*, sp. n. (Pl. XIII. fig. 15.)

2 ♀ ♀ from Port Elizabeth (*J. L. Drège*, July 1899).

Colour of carapace yellow or rufescent, the head and chelicera reddish; legs yellowish or reddish yellow; abdomen pallid, with numerous black spots in rows, the under surface with or without spots; sternum reddish yellow, with darker edges.

Closely resembling *D. lophognathus*, sp. n., but with different vulva, the transverse cavity and fold in front of the horseshoe-shaped ridge found in all the females of *Drassodes* described in the preceding pages being absent. Appearance of vulva in spirits as in Pl. XIII. fig. 15.

Chelicera with the two inferior teeth rather small, slightly unequal.

Length of trunk 6 mm.

10. *Drassodes ereptor*, sp. n. (Pl. XIII. figs. 16 & 17.)

Specimens.—(a) 5 ♀ ♀ from the Hot Baths at Montagu (*W. F. P.*, November 1902).

♀ ♀. *Colour*.—Carapace and sternum mahogany-brown,

the chelicera slightly darker ; legs yellowish brown, the two anterior pairs with the three distal segments darker brown ; abdomen more or less infuscated, the ventral surface generally paler.

Carapace broad ; width of the head across the second line of eyes a little more than half but less than two thirds of the greatest width of the carapace. Anterior row of eyes procurved, the eyes subequal, the posterior row lightly procurved, the medians obliquely elongate-oval, subcontiguous, and about an eye's diameter or slightly more from the smaller lateral eyes ; median eye-area long, slightly wider in front than behind.

Chelicera with 2 strong, equal (rarely slightly unequal) inferior teeth (occasionally with a third minute tooth in addition) ; the superior teeth 3 in number, the middle one very strong, the proximal one small.

Legs robust ; the anterior pair unspined below, the tarsus rather short, its length being only about $\frac{2}{3}$ of that of the metatarsus ; tarsi and metatarsi of two anterior pairs densely and broadly scopulate to the base below ; posterior tarsi more feebly scopulate, but the metatarsi with only a few scopular hairs ; fourth tibia with a dorsal spine near base.

Sternum broad.

Vulva as in Pl. XIII. fig. 16.

Length of trunk 8-10 $\frac{1}{4}$, length and width of carapace in largest ♀ 4 $\frac{1}{2}$ and 3 $\frac{1}{2}$ mm.

(b) 1 ♀ from Clanwilliam (*C. L. Leipoldt*, October 1897).

(c) 1 ♀ from Bosch Kloof in the Cedarberg Range, Clanwilliam Div. (*C. L. Leipoldt*, December 1897).

(d) 1 ♂ from Salt River Flats, near Cape Town (*W. F. P.*, April 1896).

♂.—Closely resembling the ♀ ♀, with similar chelicera, legs, eyes, &c.

Maxillæ normal, without keel on outer edge of lower surface.

Pedipalps.—Tibia cylindrical, strongly spined at apex and provided with a small external diverging spur, which is tipped with a sharp, curved, black tooth, its length (exclusive of the spur) subequal to that of the patella ; tarsus narrow-ovate, acuminate, small, about as long as the patella and half the tibia (exclusive of the spur), its inner side with several spines ; palpal organ with a long slender spine commencing near base and extending along under surface to apex (Pl. XIII. fig. 17).

Length of trunk 6 $\frac{3}{4}$ mm.

The abdomen of the ♂ has a small scutellum in front.

Genus SCOTOPHÆUS, E. Sim.

Scotophæus relegatus, sp. n.
(Pl. XIII. figs. 18 & 18 a.)

Specimens.—(a) 1 ♂ from Cape Town (*E. A. Morris*).

Colour.—Legs and carapace pale ochraceous; the head and chelicera testaceous yellow; abdomen yellowish, darker posteriorly, with large scutum in front.

Carapace narrowed in front, the width of the head across posterior line of eyes being more than $\frac{1}{2}$ but considerably less than $\frac{2}{3}$ of the greatest width of the carapace; head much depressed. Anterior row of eyes procurved, the medians largest, their lower margins, seen from in front, in a line with the centres of the laterals, the length of the clypeus equal to that of a lateral eye, the median eyes only narrowly separated from the laterals. Posterior row of eyes lightly procurved, the median eyes slightly oval, almost rotund, small, being only slightly larger than the lateral eyes, their distance apart a little less than an eye's diameter and their distance from the laterals equal to nearly $1\frac{1}{2}$ diameters.

Chelicera much attenuated at apex, the upper margin with one large and a couple of small teeth and the lower margin with one small tooth.

Maxillæ rather long, dilated externally at apex, the outer margin being emarginate.

Sternum rather narrow, strongly attenuated in front and produced.

Legs stoutish and rather short, the tarsi and anterior metatarsi scopulate to the base, the posterior metatarsi scopulate at apex only; anterior metatarsus with a pair of basal spines; first tibia with 3 inner and 2 outer spines below and some distal scopular hairs on inner side.

Pedipalps.—Patella slightly longer than the tibia (exclusive of the process), the two segments together almost equal in length to the small tarsus; lateral process of tibia small, terminating in a sharp incurved claw; palpal organ with black spiral-shaped distal spine and a red hook-like process on outer side next to the spine (Pl. XIII. figs. 18 & 18 a).

Length of trunk $8\frac{1}{4}$ mm.

(b) 1 ♂ from Robben Island in Table Bay (*A. Tucker*), measuring only 5 mm. in length.

There are also a number of females in the Collection apparently belonging to several species.

Genus DIAPHRACTUS *, nov.

Carapace longish ovate, depressed, broad in front, with thoracic stria. Anterior row of eyes almost straight, the eyes a little separated from one another, the medians largest. Posterior row of eyes considerably wider and slightly procurved, the medians subrotund, small. Lateral eyes on each side a little nearer together than the anterior and posterior median eyes. Chelicera strong, somewhat attenuated at apex, the oblique superior margin with three small teeth remote from one another; no inferior teeth present. Labium elongate, narrow, and parallel-sided, only slightly attenuated, emarginate at apex, and reaching almost up to the inner angles of the maxillæ, the lateral margins narrowly keeled, the surface depressed between the keels. Maxillæ broad, strongly depressed, slightly dilated externally at apex and emarginate behind the dilation, the base attenuated, the inner margin straight, the outer margin strongly convex in posterior two-thirds, the posterior three-fourths of maxilla bordered along inner, posterior, and outer margins by a strong continuous keel. Sternum long-ovate, strongly attenuated in front and produced. Legs robust, short, the posterior pairs numerous, the anterior pairs more sparsely spined.

Apparently closely allied to *Scotopheus*, E. Sim., but resembling a *Clubiona* in appearance.

Type: *D. Leipoldti*, sp. n.

Diaphractus Leipoldti, sp. n. (Pl. XIII. fig. 19.)

1 ♀ from Rondegat, near Clanwilliam (*C. L. Leipoldt*).

Colour.—Carapace testaceous yellow, the head in front and the chelicera reddish; legs pale yellow, the distal segments of the anterior pairs reddish; sternum and mouth-parts reddish testaceous below; abdomen pale yellowish, with brownish hairs.

Carapace.—Width of head across posterior line of eyes at least $\frac{2}{3}$ of the greatest width of the carapace. Clypeus slightly less than a lateral eye in length; posterior eyes of equal size, small, the medians about a diameter and a half apart and quite two diameters from the lateral eyes.

Legs.—All the tarsi and the anterior metatarsi scopulate to the base; metatarsus I with 1–2 basal spines; tibia I stout, with tiny scopula on each side at apex, and with 2 short outer and 2–3 short inner spines below.

* *Hedged round*, alluding to the maxillæ.

Vulva (Pl. XIII. fig. 19) with broad median keel, a cavity (bordered externally by a curved ridge) on each side of the keel, and a large receptaculum partly on outer side of and partly below each cavity.

Length of trunk $11\frac{1}{2}$ mm.

Genus XEROPHÆUS, nov.

Carapace moderately convex, attenuated in front, with thoracic stria. Anterior row of eyes strongly procurved, the median eyes large. Posterior row of eyes wider, moderately or strongly procurved, the median eyes generally large, obliquely oval or angular and rather close together. Lateral eyes of each side much closer together than the anterior and posterior median eyes. Chelicera hardly or not attenuated at apex, with three (sometimes two) superior teeth and one inferior tooth, the latter absent in some species. Sternum as in *Drassodes*, rather broad in front, or, at any rate, not strongly attenuated nor produced. Legs generally rather short and robust, the anterior pairs spined below on the metatarsi and tibiæ; tarsi and anterior metatarsi scopulate to the base, the posterior metatarsi and often also the anterior tibia scopulate distally. Abdomen of male scutate above at base.

Type: *X. capensis*, sp. n.

This genus is evidently closely allied to *Scotophæus*, which differs from it, according to Simon's diagnosis, principally in having the sternum strongly attenuated in front. In *Scotophæus*, also, both rows of eyes are apparently straighter, the chelicera more strongly attenuated at apex and the head more depressed.

The species fall into two sections:—

§ 1. *Species in which the median groove of the vulva of the female terminates anteriorly in a small transverse pocket.* (Spp. 1-9.)

1. *Xerophæus capensis*, sp. n. (Pl. XIII. figs. 20 & 20 a.)

Specimens.—(a) 11 ♂♂ and 7 ♀♀ from the northern base of Devil's Peak, Cape Peninsula; also 2 ♀♀ from the northern base of Table Mountain.

Characters of a ♂ specimen (type):—

Carapace narrowed in front, its width across the posterior row of eyes more than $\frac{1}{2}$ but less than $\frac{2}{3}$ of the greatest width. Anterior row of eyes strongly procurved, the median eyes close to the laterals and larger, much further from one another, their lower margins on a level with (or slightly

higher than) the centres of the latter; clypeus very slightly or scarcely longer than an anterior lateral eye's diameter; posterior row of eyes strongly procurved, a line joining the hind margins of the laterals passing slightly in front of the centres of the medians; the median eyes ovate, larger than the laterals and distant about their own length from the latter and nearly half their own length from one another; median eye-area longer than wide, broadest in front; lateral eyes on each side subequal and between $\frac{1}{2}$ – $\frac{3}{4}$ of a diameter apart; width of the posterior row of eyes slightly more than half the width of the head at the same place, the posterior row also about half a lateral eye's diameter wider on each side than the anterior row.

Chelicera with 1 weak inferior and 3 superior teeth, only the middle one being large.

Legs robust; all the tarsi and the two anterior pairs of metatarsi scopulate to the base, the posterior scopulae divided by a broad band of setae; two posterior pairs of metatarsi with a distal scopular band on the side; tibia I with an inner row of 2 spines below; metatarsus I with a pair of basal spines.

Pedipalps.—Tibia (Pl. XIII. fig. 20) measured along upper inner edge subequal to the patella in length, its outer side produced at apex into a long, stout, curved process, which is closely appressed to the tarsus along its whole length with the exception of the apex; this process very broad at base, then suddenly narrowed, the narrow portion long, straight, slightly constricted above and below near apex and ending in a black curved claw. Tarsus large, broadly ovate, acuminate, its length equal to that of the tibia (inclusive of the process), its inner margin with wide shallow sinus. Palpal organ very large and compact, occupying the whole width of the underside of the tarsus excepting at the apex, its lower surface divided longitudinally by a dark ridge and provided at the apex with two short processes.

♀ ♀.—*Legs* more densely scopulate, the first tibia with a short, internal, distal scopula (almost obsolete in the ♂).

Vulva consisting of a dark, convex, hairy, nearly rotund plate (slightly longer than wide), divided longitudinally by a deep groove, which is bordered on each side by a low, smooth, black ridge, the ridges united anteriorly in front by a transverse bridge spanning the anterior end of the groove and ending separately behind in a rounded black convexity; the edge of the bridge (which is visible only when dry, as in Pl. XIII. fig. 20 a) is situated on a level with the anterior edge of the rotund plate, and beneath it the groove is con-

tinued anteriorly for a very short distance, forming a tiny brown pocket, which is truncated or rounded at the anterior end and distinctly visible in spirits through the integument.

Length of trunk, ♀ ♀ $8\frac{1}{2}$ – $11\frac{1}{2}$, ♂ ♂ 6 – $8\frac{1}{2}$ mm.

In the maturer specimens of both sexes the carapace is testaceous yellow and thickly clothed with silky yellowish hairs and some scattered fine black bristles; the chelicerae are testaceous and the legs yellowish, with the distal segments testaceous; the abdomen is densely clothed with silky, light or dark, somewhat bronzy brown hairs.

The first tibia has 2–3 spines in the inferior row, and the posterior median eyes are often a little more than an eye's length distant from the laterals, especially in the ♀ ♀.

(b) 2 ♂ ♂ and 5 ♀ ♀ from Stellenbosch (*Dr. R. Broom*).

(c) 2 ♂ ♂ from near Tulbagh Road Station (*W. F. P.*).

(d) 2 ♀ ♀ from Clanwilliam (*R. M. Lightfoot and C. L. Leipoldt*).

(e) 1 ♀ from Boschkloof Waterfall, Cedarbergen, Clanwilliam Div. (*R. Pattison*).

2. *Xerophæus delphinurus*, sp. n.

(Pl. XIII. fig. 21.)

Specimens.—(a) 6 ♂ ♂ from the Cape Peninsula (Cape Flats, Bergvliet, Silver Mine Stream, and Hout Bay: *W. F. P.*).

Characters of a ♂ specimen from Bergvliet:—

Closely agreeing with the type of *X. capensis*, sp. n., and also with similar palpal organ, but differing in having the lateral process of the tibia of the pedipalps distinctly curved just before the apical claw, and with a short but rather deep sinus on the underside here, as in Pl. XIII. fig. 21.

The posterior median eyes are also a little closer together and the tibia of the first leg has 2–3 inferior spines in the inner row.

The other males are similar, but in one of them the first tibia has an extra spine on the inner surface besides the three in the inferior row.

Length of trunk $6\frac{1}{2}$ – $7\frac{1}{2}$ mm.

(b) 1 ♂ from the Hottentots Holland Mountains, Caledon Div. (near Gordons Bay: *R. M. Lightfoot*).

3. *Xerophæus interrogator*, sp. n.

(Pl. XIV. fig. 22.)

3 ♂ ♂ from the Cape Peninsula (Bergvliet and Signal Hill: *W. F. P.*).

Characters of a ♂ specimen from Bergvliet:—

Closely agreeing with the type of *X. capensis* and with similar palpal organ, but differing in having the lateral process of the tibia of the pedipalp strongly curved near apex, much more strongly so than in *X. delphinurus*, sp. n., and with a much larger inferior sinus (Pl. XIV. fig. 22).

In the other ♂♂ the first tibia has three inferior spines, and in one case the first metatarsus has two pairs of basal spines.

The anterior row of eyes are also slightly less procurved in this species than in the two preceding species, the lower edges of the medians being slightly below the level of the centres of the laterals.

Length of trunk 8 mm.

In the Museum are also 7 ♀♀ from the Cape Peninsula belonging either to this or the foregoing species or to both, and differing from the ♀♀ of *X. capensis* in that the median groove of the vulva is continued anteriorly for some distance beyond the rotund dark plate. It is noteworthy that none of these females, nor the males of *X. delphinurus* and *interrogator*, have been found on the northern slopes of Devil's Peak and Table Mountain, which are, on the other hand, the only localities in the Peninsula where the males and females of *X. capensis* have been met with.

4. *Xerophæus flavescens*, sp. n. (Pl. XIV. fig. 23.)

1 ♂ from Rondegat, near Clanwilliam (*C. L. Leipoldt*).

Colour pale yellow, the chelicera and anterior part of carapace reddish yellow; the abdomen pallid, with dark hairs and yellow scutellum.

Carapace narrower than usual; anterior median eyes large, touching the much smaller lateral eyes, whose centres are, if anything, a trifle above the level of the lower margins of the medians, the clypeus subequal to a lateral eye in length; posterior median eyes a little larger than the laterals, about $\frac{1}{2}$ of a long diameter apart and about a diameter distant from the lateral eyes.

Legs longish, the first tibia with an inner row of two spines.

Chelicera with 1 strong and 2 feeble superior teeth, the inferior tooth feeble or obsolete.

Pedipalps.—Patella decidedly longer than the tibia, the two segments together shorter than the narrow tarsus; lateral process of tibia long and narrow, bent somewhat downwards from the base, but otherwise straight, reaching nearly to end of tarsal organ and minutely inturned at the pointed apex,

very similar to that of *X. crustosus*, sp. n., but straighter; tarsal organ with the greater part of its underside white and membranous, with a long, outcurved, very fine filament arising from a small dark mesial sclerite, the inner basal angle produced into a short horn (Pl. XIV. fig. 23).

Length $8\frac{1}{2}$ mm.

5. *Xerophæus spirallifer*, sp. n.

(Pl. XIV. figs. 24 & 25.)

Specimens.—2 ♂♂ and 5 ♀♀ from Hanover, and a ♂ and ♀ from Eiertontein, 8–9 miles west of Hanover (*S. C. Cronwright Schreiner*).

♂♂ (*types*).—*Colour* like that of *X. capensis*, sp. n.

Carapace shaped as in *X. capensis*. Anterior row of eyes very strongly procurved, the medians large, very close to the laterals, and with their inferior margins a little above the line joining the centres of the latter; clypeus equal to or very slightly longer than a lateral eye; posterior row of eyes only slightly wider than the anterior row, strongly procurved, a line joining the hind margins of the laterals cutting the medians in front of their centres, the median eyes very large, ovate, separated by not more than $\frac{1}{4}$ of their long diameter from one another and by about a diameter from the laterals; anterior and posterior lateral eyes slightly less than a posterior eye's diameter apart.

Chelicera and *legs* as in *capensis*, but with fewer spines, the first metatarsus having 1–2 basal spines and the first tibia only 1 inferior spine.

Pedipalps.—Tibia, viewed from above, turbinate, much broader distally than long, its length, measured along inner upper edge, a little less than that of the patella; its distal part strongly produced laterally on outer side, the process very thick and strong, truncated at apex and bearing on its anterior side a slenderer acuminate process, which is directed forwards almost at right angles to the other and ends in a claw curving downwards; tarsus large, strongly acuminate and incurved distally, its length very much greater than that of the patella and tibia together (inclusive of the process), the distal portion projecting for more than $\frac{1}{3}$ of the whole length beyond the cavity containing the palpal organ; palpal organ complicated, bearing two long spines, viz. a white one arising from the middle of the outer edge, thence running in a slight curve forwards, and ending just before reaching the apex of the tarsus, and an extremely long red spine, which starts at anterior end, and, after describing a spiral curve and

a half, runs backwards to the base of the tarsus and then curves forwards again, running along the outer edge of the tarsus alongside of the white spine, and ending together with the latter. In spirits the underside appears as in Pl. XIV. fig. 24.

♀ ♀.—Tibia and metatarsus of first leg often unspined below, the tibia with conspicuous internal scopula.

Vulva appearing in spirits as in Pl. XIV. fig. 25, and consisting of four dark convexities, joined in pairs on each side by a curved deep black ridge and separated by a large longitudinal groove which terminates in front in a small pocket.

Length of trunk, ♂ ♂ $7\frac{3}{4}$ – $8\frac{3}{4}$, ♀ ♀ 7– $10\frac{1}{2}$ mm.

6. *Xerophæus aridus*, sp. n. (Pl. XIV. fig. 26.)

1 ♀ from Tsabis in Bushmanland, 20 miles north-east of Concordia, Namaqualand Div. (*J. H. C. Krapohl*).

Closely allied to *X. spiralifer*, sp. n., but larger.

Carapace similar, but clothed with pale pubescence; anterior row of eyes strongly procurved, the clypeus exceeding the lateral eyes in length; posterior row of eyes also strongly procurved, a line joining the posterior margins of the laterals only just cutting the larger median eyes, the latter eyes about $\frac{1}{4}$ of a long diameter apart, and, if anything, slightly more than a diameter from the lateral eyes.

Legs.—Tibia I scopulate on both sides distally, with one inner apical spine.

Chelicera with 3 superior but no inferior teeth.

Vulva (Pl. XIV. fig. 26) with two deep angular lateral cavities, the anterior pocket situated more posteriorly than in *X. spiralifer*.

Length of trunk 12 mm.

7. *Xerophæus lunulifer*, sp. n. (Pl. XIV. figs. 27 & 28.)

Specimens.—9 ♂ ♂ and 13 ♀ ♀ from Signal Hill and the northern and western slopes of Table Mountain and Devil's Peak in the Cape Peninsula (*F. Treleaven, W. F. P.*).

♂ ♂ (*types*). *Colour of dark specimens*.—Carapace mahogany-red, with yellow pubescence; chelicera dark red; legs pale testaceous yellow; abdomen with dark brown or nearly black hairs above, the underside paler.

Carapace.—Width of head across the posterior line of eyes almost or quite $\frac{2}{3}$ of the greatest width of the carapace. Anterior median eyes larger than the laterals and separated

from them, their lower margins, if anything, a trifle below the level of the centres of the latter, the clypeus considerably longer than a lateral eye's diameter; posterior row of eyes considerably wider than the anterior row and moderately procurved, a line joining the hind margins of the laterals passing slightly in front of the centres of the medians; the latter oval, a little larger than the laterals, their distance apart about $\frac{1}{2}$ a long diameter (more or less), their distance from the laterals slightly exceeding a long diameter; the lateral eyes on each side about a diameter or slightly less apart.

Chelicera with 3 well-developed teeth on the superior margin, the middle one being very large, the inferior margin with a strong tooth.

Legs with the scopulæ and spines as in *X. capensis*, sp. n., but the first tibia with only 1-2 inferior spines and occasionally with an internal spine in addition, but no basal spine.

Pedipalps longish; the tibia cylindrical, longish, its length (exclusive of the process) a little exceeding that of the patella, its upper surface with a strong mesial spine, its lateral process slender, acuminate, straight or slightly upturned distally when viewed from the side, but slightly curved when viewed from below and simply pointed; tarsus small and narrow, acuminate, the apex obtuse, palpal organ narrower than the tarsus, appearing in spirits as in Pl. XIV. fig. 27, the apical spine very slender, out-turned.

♀ ♀.—*Eyes* more spaced out than is generally the case in the male, the posterior medians often separated by a space only slightly less than a long diameter and generally about $1\frac{1}{2}$ - $1\frac{3}{4}$ diameters distant from a lateral eye, the posterior medians also often scarcely larger than the laterals.

First *tibia* with the distal scopula distinct and occasionally with three inferior spines below in the distal half, the basal spine always absent.

Vulva appearing in spirits as in Pl. XIV. fig. 28; the posterior part with a pair of blackish somewhat reniform convexities, each with an intensely black cavity on the medial side, and separated by a long median keel, which is strongly convex from behind to in front and sharply marked off on each side; in front of the anterior end of the keel is a small pocket opening posteriorly and visible through the integument as a brown half-moon.

Length, ♂ ♂ $9\frac{1}{2}$ - $11\frac{1}{2}$, ♀ ♀ $8\frac{1}{2}$ - $14\frac{1}{2}$ mm.

8. *Xerophæus spoliator*, sp. n.
(Pl. XIV. figs. 29 & 30.)

Specimens.—2 ♂♂ and 2 ♀♀ from Hanover (S. C. Cronwright Schreiner).

Allied to *X. lunulifer*, sp. n., the darker specimens similarly coloured.

♂♂ (*types*).—*Carapace* and *eyes* much as in the ♂ of *lunulifer*, except that the clypeus is shorter and may be subequal to the length of a lateral eye.

Chelicera with 3 (sometimes 4) superior teeth, of which the proximal one is minute; the inferior margin without teeth.

Legs with the scopulæ much as in *X. capensis*, sp. n.; metatarsus I with a pair of basal spines; tibia I with 3 (in one leg with 5) pairs of inferior spines.

Pedipalps shortish; tibia (exclusive of the process) subequal in length to the short patella, produced at apex on outer side into a stout, dark red, simple process, which hardly equals the rest of the joint in length; tarsus very like that of *X. lunulifer*; palpal organ simple, narrower than the tarsus, the apical spine short and stoutish, directed inwards and upwards (Pl. XIV. fig. 29).

♀♀.—*Legs*. Tibia I with small scopula on outer as well as inner side below and with a single inferior row of 3 spines.

Eyes more spaced than in the ♂, the posterior medians at least $\frac{1}{4}$ of a long diameter apart and nearly or quite 2 diameters from the laterals, which may be distant a diameter or more from the anterior laterals.

Vulva appearing in spirits as in Pl. XIV. fig. 30; the two oblique cavities (lighter in the figure) are separated by a broad keel, which is grooved along the median line and diverges posteriorly; in front of the keel is another cavity terminated anteriorly by the brown pocket.

Length of trunk, ♂♂ 9–11, ♀♀ 15 mm.

9. *Xerophæus Lightfooti*, sp. n.
(Pl. XIV. figs. 31 & 32.)

Specimens.—1 ♂ and 1 ♀ from Triangle, Worcester Div. (R. M. Lightfoot, May 1898).

Closely allied to *X. spoliator*, sp. n., and similarly coloured.

♂.—*Carapace* narrower in front, the width of head across the posterior line of eyes less than $\frac{2}{3}$ of the greatest width of the carapace. Anterior median eyes close to the much

smaller laterals, their lower margins on a level with the centres of the latter, the clypeus longer than an eye's diameter. Posterior row of eyes strongly procurved, the median eyes distinctly larger than the laterals and nearly $\frac{1}{2}$ a long diameter apart, their distance from the laterals also decidedly exceeding their own length.

Chelicera with only 2 distinct teeth in upper margin, that corresponding to the proximal tooth of the other species being quite obsolete, the lower margin without teeth.

Legs scopulated much as in *X. capensis*, sp. n.; metatarsus I with two basal spines; tibia I with an inferior row of 3 spines.

Pedipalps longer than in *spoliator*, the tibia attenuated at base, its dorsal side a little longer than the patella and angularly produced at apex, the angle ending in a short slightly out-turned spur; outer distal edge of tibia obliquely truncated and provided with a small, blunt, subcylindrical process, which curves slightly upwards and inwards at apex; tarsus rather broadly ovate, acuminate at apex; palpal organ very like that of *spoliator* but larger, the apical spine hook-like, strongly curving inwards and upwards (Pl. XIV. fig. 31).

♀.—*Chelicera* sometimes with a minute proximal third tooth.

Tibia I with small internal scopula and an interior row of 2-3 inferior spines.

Vulva-plate appearing in spirits as in Pl. XIV. fig. 32, as broad as long, allied in form to that of *spoliator*, but smaller, the pair of cavities (light in the figure) separated by a broader keel, which is shallowly grooved longitudinally, its edges diverging anteriorly as well as posteriorly, each cavity with a large dark-coloured convexity behind it, the median groove of the keel deepened anteriorly but not posteriorly and not reaching hind end of the vulva-plate.

Length of trunk, ♂ ♀, 9 mm.

§ 2. *Species in which the longitudinal groove of the vulva of the female is provided anteriorly with a flexible tongue-like appendage instead of a pocket.* (Spp. 10-16.)

10. *Xerophæus communis*, sp. n.
(Pl. XIV. figs. 33, 33 a, & 34.)

Specimens.—(a) 1 ♂ and 3 ♀ ♀ from the Willowmore District (E. H. L. Schwarz).

♂ (*type*).—Very like *X. capensis* in form, colour, and in the characters of the eyes, legs, and chelicera.

Posterior median eyes about a third of a long diameter apart, the clypeus slightly less than a lateral eye's diameter.

Legs.—Tibia I with 1 outer and 1–2 inner spines below.

Pedipalps.—Patella very slightly longer than the tibia (exclusive of the process), the two segments together equalling the tarsus in length; tibia (Pl. XIV. fig. 33 a) oval, cylindrical, provided at its outer distal margin with a strong spiniform process, which is only slightly shorter than the tibia itself, the apex of the process pointed and minutely incurved but not upcurved; palpal organ as in Pl. XIV. fig. 33, the apex with a short, fine, curved spine, the apex of the black sclerite at the inner basal angle produced upwards into a minute process.

♀ ♀.—Tibia I scopulate on both sides distally, but especially on the inner side, the under surface with an inner row of 2 spines.

Vulva (Pl. XIV. fig. 34) with a large median groove, containing in its anterior part a large tongue-shaped appendage, the convexity on each side of the posterior half of the groove bordered externally by a curved, black, comma-shaped mark and furrow, the anterior part of the groove flanked on each side by a small depression, the apex of the appendage marked with a small brown spot.

Length of trunk, ♂ 8, ♀ ♀ $8\frac{3}{4}$ – $11\frac{3}{4}$ mm.

(b) 1 ♂ from the Baths near Montagu (W. F. P.).

(c) 1 ♂ and 1 ♀ from Touws River Station, Worcester Div. (W. F. P.).

(d) 1 ♂ from Laingsburg, Prince Albert Div. (W. F. P.).

(e) 2 ♂ ♂ from Prince Albert Village (W. F. P.).

(f) 2 ♂ ♂ and 5 ♀ ♀ from Hanover and neighbourhood (Vlagkop, Eierfontein: S. C. Cronwright Schreiner).

(g) 1 ♂ from Dunbrody (Rev. J. A. O'Neil).

(h) 1 ♂ and 3 ♀ ♀ from the Kentani District, Transkei (Rev. F. C. Kolbe, Miss A. Pegler, and H. P. Abernethy).

(i) 1 ♂ from Rhode, Mount Ayiliff Distr., Pondoland (A. Weisbecker).

Also many other specimens, apparently females of this species, from various parts of Cape Colony.

This is the commonest and most widely distributed species in Cape Colony. In the ♂ ♂ the first tibia has 1 outer and usually 2 (rarely 1 or 4) inner spines below, including an apical pair, but in the ♀ there is no outer apical spine below. The length of the clypeus sometimes equals the length of an anterior lateral eye, and the posterior median eyes are sometimes as much as half an eye's diameter apart. The apical

spine of the palpal organ is frequently much straighter than in the type.

11. *Xerophæus aurariarum*, sp. n.
(Pl. XIV. figs. 35 & 36.)

Specimens.—4 ♂♂ (types) and 3 ♀♀ from Witwatersrand, Transvaal (*Miss A. Pegler*); also several ♀♀ from Johannesburg (*H. A. Fry*) and Krugersdorp, Transvaal.

Closely resembling *X. communis* in general characters, except:—

Length of clypeus exceeding that of an anterior lateral *eye*, the lower margins of the median eyes also slightly above the level of the centres of the laterals.

Tibia of first *leg* with 1 outer and 1 inner apical spine (rarely with 2 inner spines below) in the ♂, but with only 1 inferior spine in the ♀.

Pedipalps of ♂ short, the patella a little longer than the tibia (exclusive of the process), the two segments together distinctly shorter than the tarsus; lateral process of tibia resembling that of *X. communis* in shape, but subequal to the rest of the joint in length; palpal organ as in Pl. XIV. fig. 35.

Vulva of ♀ as in Pl. XIV. fig. 36, the receptaculum seminis on each side large, embracing the comma-shaped black grooves.

Length of trunk, ♂♂ 7-8½, ♀♀ 10½-12¾ mm.

12. *Xerophæus exiguus*, sp. n.
(Pl. XIV. figs. 37 & 37 a.)

1 ♂ from Laingsburg, Prince Albert Div. (*R. M. Lightfoot*, August 1903).

Closely resembling *X. communis*, sp. n., but smaller.

Pedipalps.—Tibia (exclusive of the process) subequal to the patella in length, produced on its outer side into a stout acuminate process, which is slightly upturned at apex and is as long as the rest of the joint (Pl. XIV. fig. 37 a); tarsus ovate, acuminate, longer than the patella and tibia (exclusive of the process); palpal organ very like that of *communis* (Pl. XIV. fig. 37).

Length of trunk 6½ mm.

13. *Xerophæus rostratus*, sp. n.
(Pl. XIV. figs. 38, 38 a, & 39.)

Specimens.—1 ♂ (type) and 1 ♀ from Graaff Reinet (*J. Paynter*, September 1902).

Closely resembling *X. communis*, sp. n., in characters of carapace, eyes, spine-armature, and scopulæ of legs, &c.

Length of *clypeus* subequal to the length of an anterior lateral eye.

Legs rather longish, the first tibia in the ♂ with a few inner scopular hairs.

Chelicera with a strong inferior tooth.

Pedipalps of ♂ longer than in *X. communis*, the patella as long as the tibia (exclusive of the process), but the two segments together longer than the tarsus; lateral process of tibia short and stout, the apex suddenly narrowed and claw-like, strongly curved inwards and a little downwards (Pl. XIV. fig. 38); palpal organ larger and more extensively chitinized than in *communis*, the apical spine very short (Pl. XIV. fig. 38 a).

Vulva of ♀ nearly but not quite like that of *communis*, differing mainly in the form of the receptaculum seminis (Pl. XIV. fig. 39).

Length of trunk, ♂ $10\frac{1}{2}$, ♀ 12 mm.

14. *Xerophæus crustosus*, sp. n. (Pl. XV. fig. 40.)

1 ♂ from East London (*J. Wood*).

Allied to *X. communis*, sp. n., but larger.

Carapace mahogany-red, the head narrow; anterior median eyes with their lower margins situated slightly below the level of the centres of the lateral eyes, the *clypeus* a little longer than a lateral eye; posterior row of eyes much wider than the anterior row, the median eyes equal to the laterals in size and at least $\frac{3}{4}$ of a long diameter apart, distant from the laterals about $1\frac{1}{2}$ times a long diameter.

Chelicera with weak lower tooth, but strong upper teeth.

Legs very robust, the first tibia with 0-1 outer and 2 inner spines below.

Pedipalps.—Tibia (viewed from above) attenuated at base, its length (exclusive of the process) slightly less than that of the patella, the lateral process resembling that of *X. communis* in shape, but very long, much longer than the rest of the joint, and reaching as far as the distal end of the palpal organ, its distal part slightly curving upwards, the apex pointed and minutely incurved; palpal organ very like that of *X. communis*, the apical spine short (Pl. XV. fig. 40).

Length of trunk 11 mm.

15. *Xerophæus appendiculatus*, sp. n.
(Pl. XV. figs. 41 & 42.)

Specimens.—(a) 3 ♂♂ and 1 ♀ from Hanover (C. S. Cronwright Schreiner).

♂♂ (*types*).—*Colour* of carapace light testaceous yellow, the legs slightly paler; the chelicera blackish red; the abdomen clothed with brown hairs.

Carapace.—Width of head across posterior median eyes almost or quite $\frac{2}{3}$ of the greatest width of the carapace. Anterior row of eyes strongly procurved, the lower margins of the median eyes slightly above the level of the centres of the laterals, the clypeus long, almost twice as long as a lateral eye; posterior row of eyes much wider than the anterior row, moderately procurved, a line joining the hind margins of the laterals cutting the medians a little in front of their centres; the posterior median eyes oval, much larger than the laterals, distant from the latter about $1\frac{1}{4}$ times a long diameter or slightly more, but only $\frac{1}{4}$ of a diameter from one another; lateral eyes on each side separated by a little more than a posterior eye's diameter.

Chelicera with the inferior tooth rather small.

Legs longish, the first tibia conspicuously scopulated on each side distally, the posterior metatarsus strongly scopulate on each side; metatarsus I with 2 basal spines; tibia I with an inferior row of 2-3 spines.

Pedipalps.—Tibia (exclusive of the process) short, equal to the patella in length, its shape turbinate when seen from above, its lateral process very long, as long as the patella and tibia together, closely appressed to the tarsus except at the apex, slender, pointed, appearing perfectly straight when seen from the side (except at base, where it is slightly bent and suddenly and strongly thickened); tarsus long, ovate, acuminate; palpal organ rather complex, provided in the middle at apex with a short, curved, black spine or spur and a long, extremely fine filament, and on the inner side at the base with a stout, curved, obtuse process (Pl. XV. fig. 41).

♀.—*Eyes* slightly more spaced, the clypeus $1\frac{1}{2}$ times the length of an anterior lateral eye, the median eyes a little removed from the laterals, the posterior median eyes distant at least $1\frac{1}{2}$ times a long diameter from the posterior laterals.

Legs.—Metatarsus I with 1-2 basal spines.

Vulva (Pl. XV. fig. 42) with a couple of large lateral depressions, which are bordered on the inner side by a pair of sharp black edges converging posteriorly, each depression containing a large brown convexity posteriorly; anterior

part of vulva-plate with a median, flexible, tongue-like appendage lying in a groove.

Length of trunk, ♂ ♂ 9-9 $\frac{3}{4}$, ♀ 12 mm.

(b) 1 ♂ and 1 ♀ from Zululand (*W. Anderson*). The ♂ does not apparently differ from the type, but in the ♀ the appendage of the vulva reaches further back relatively to the lateral cavities.

16. *Xerophæus Patricki*, sp. n. (Pl. XV. fig. 43.)

1 ♂ from the Pungwe, 50 miles east of Umtali, in Portuguese East Africa (*D. L. Patrick*).

Colour, form of *carapace*, and the ocular area resembling that of *X. communis*, except that the clypeus is distinctly longer than an anterior lateral eye; the posterior median eyes oval, large, much larger than the laterals, and $\frac{1}{3}$ of a long diameter apart.

Chelicera with the inferior tooth very small.

Legs longish, slender; metatarsus I with 0-1 basal spine; tibia I sparsely scopulate on both sides distally, the underside with an inner row of 3-4 spines.

Pedipalps.—Tibia (exclusive of the process) slightly longer than the patella, its lateral process resembling that of *X. communis* in shape, but straighter, almost as long as the rest of the joint, its apex pointed and minutely incurved, not quite reaching to the middle of the tarsus; palpal organ somewhat like that of *X. appendiculatus*, with similar internal process, but with only a short apical spine, which is directed outwards and downwards (Pl. XV. fig. 43).

Length of trunk 8 $\frac{1}{2}$ mm.

Genus MELANOPHORA, C. Koch.

1. *Melanophora fuliginea*. (Pl. XV. figs. 44-46.)

Specimens.—(a) 7 ♀ ♀ from Signal Hill, Cape Town, and several ♂ ♂ from the same locality. Females of this species have not been found in other parts of the Peninsula.

♀ ♀ (*types*).—*Colour* black, the legs brownish distally and frequently also at base, the first pair of femora with large pale yellowish area on both inner and outer surfaces; pulmonary opercula pale yellowish or brownish, the post-genital portion of the abdomen often more or less pale yellowish.

Anterior row of *eyes* strongly procurved, the lateral eyes considerably larger than the medians, the length of the clypeus

a little exceeding that of a lateral eye; posterior row of eyes almost straight (scarcely recurved), a little wider than the anterior row, the median eyes flattish and appearing (in spirits), if anything, slightly smaller than the convex lateral eyes, their distance apart also slightly less than or subequal to their distance from the laterals.

Chelicera normally with 1 large and 3 small superior and 2 small but distinct inferior teeth on the inner margin.

Legs.—Anterior tarsi and metatarsi scopulate below, the first metatarsus with 2 inferior basal spines, the tibia unspined.

Vulva as in Pl. XV. fig. 44.

♂♂. *Pedipalps*.—Patella a little longer than the tibia (exclusive of the lateral process); tibia with simple straight lateral process, which is slightly longer than the rest of the segment; tarsus oval, acuminate, slightly shorter than the patella and tibia, together with the lateral process; tarsal organ as in Pl. XV. fig. 45, the distal spine curved, strong, with a smaller spine on its side at some distance from the apex (fig. 46), the apex itself not projecting out of the cavity of the tarsus.

Length of trunk, ♀♀, $6\frac{3}{4}$ –9 mm.

(b) 2 ♀♀ and 1 ♂ from Slanghoek, Worcester Div. (W. F. P.).

2. *Melanophora invida*, sp. n. (Pl. XV. fig. 47.)

Specimens.—(a) 9 ♀♀ from various parts of the Cape Peninsula (Cape Flats, Camps Bay, Hout Bay, Kalk Bay Mountain) and 1 ♀ from Maitland Flats, Cape Div.*

Vulva as in Pl. XV. fig. 47, being very wide and practically filling the space between the lung-opercula.

Other characters as in *M. fuliginea*, sp. n., but the inferior teeth of the chelicera very minute and sometimes apparently obsolete.

Length of trunk, ♀♀, $6-7\frac{1}{4}$ mm.

(b) 1 ♀ from Stellenbosch (*Dr. R. Broom*).

(c) 1 ♀ from near Bethlehem, Stellenbosch Div. (*G. French*).

(d) 1 ♀ from Ceres (*W. F. P.*).

(e) 2 ♀♀ from Rabiesberg, Worcester Div. (*W. F. P.*).

(f) 1 ♀ from Touws River, Worcester Div. (*W. F. P.*).

* I am unable to identify the males of this and the following Peninsular forms. Some of these males are apparently scarcely distinguishable from those of *M. fuliginea*, sp. n.

3. *Melanophora Lightfooti*, sp. n. (Pl. XV. fig. 48.)

2 ♀ ♀ from Ceres (*R. M. Lightfoot*).

Vulva as in Pl. XV. fig. 48.

Closely allied to *M. invida*, sp. n. *Chelicera* with 2-3 distinct inferior teeth.

Length of trunk $6\frac{1}{2}$ - $8\frac{1}{2}$ mm.

4. *Melanophora Simoni*, sp. n. (Pl. XV. fig. 49.)

Specimens.—(a) 12 ♀ ♀ from various parts of the Cape Peninsula (Cape Flats, Camps Bay, Hout Bay, Kalk Bay and Table Mountains), including a specimen from Signal Hill.

Vulva as in Pl. XV. fig. 49.

Closely resembling *M. fuliginea*, sp. n., but smaller and often less black. Posterior median eyes more convex and more sharply defined.

Length of trunk, ♀ ♀, $5\frac{1}{2}$ - $6\frac{1}{2}$ mm.

(b) 1 ♀ from Grahamstown (*Rev. J. A. O'Neil*).

5. *Melanophora redunca*, sp. n. (Pl. XV. fig. 50.)

Specimens.—(a) 5 ♀ ♀ from the Cape Peninsula (Cape Flats, Kalk Bay Mountain).

Vulva as in Pl. XV. fig. 50.

Other characters as in *M. Simoni*, sp. n. *Chelicera* with 2-3 minute inferior teeth.

Length of trunk, ♀ ♀, $5\frac{1}{4}$ - $6\frac{1}{2}$ mm.

(b) 1 ♀ from Brandvlei, Worcester Div. (*W. F. P.*).

(c) 1 ♀ from Touws River, Worcester Div. (*W. F. P.*).

(d) 1 ♀ from Avontuur, near Stormsvlei, Swellendam Div. (*W. F. P.*).

6. *Melanophora montana*, sp. n. (Pl. XV. fig. 51.)

Specimens.—(a) 3 ♀ ♀ from the Cape Peninsula (Table Mountain, &c.).

Vulva as in Pl. XV. fig. 51.

Other characters as in *M. fuliginea*, sp. n. *Chelicera* with 2-3 inferior teeth.

Length of trunk $6\frac{3}{4}$ - $8\frac{1}{4}$ mm.

(b) 1 ♀ from Port Elizabeth (*J. L. Drèje*).

7. *Melanophora Broomi*, sp. n. (Pl. XV. fig. 52.)

Specimens.—(a) 1 ♀ from Stellenbosch (*Dr. R. Broom*).

Vulva as in Pl. XV. fig. 52.

Other characters as in *M. Simoni*, sp. n.

Length of trunk 5 mm.

(b) 1 ♀ from Bergvliet, Cape Peninsula (*W. F. P.*).

(c) 2 ♀ ♀ from St. Helena Bay, Malmesbury Div. (*J. E. C. Goold*).

(d) 2 ♀ ♀ from Porterville Road (formerly Piquetberg Road) Station, Tulbagh Div. (*R. M. Lightfoot*).

(e) 1 ♀ from Tulbagh Road (*W. F. P.*).

8. *Melanophora Gooldi*, sp. n. (Pl. XV. fig. 53.)

3 ♀ ♀ from Stompneus and Steenberg's Cove, St. Helena Bay, Malmesbury Div. (*J. E. C. Goold*).

Vulva as in Pl. XV. fig. 53.

Other characters as in *M. fuliginea*, sp. n.

Length of trunk $6\frac{1}{2}$ – $8\frac{1}{2}$ mm.

9. *Melanophora Cronwrighti*, sp. n.
(Pl. XV. figs. 54 & 55.)

Specimens.—(a) 19 ♀ ♀ and 4 ♂ ♂ from Hanover, and 1 ♀ and 2 ♂ ♂ from Vlagkop, 5–6 miles north of Hanover, all collected by Mr. S. C. Cronwright Schreiner.

Very closely allied to *M. Gooldi*, sp. n., but the ♀ ♀ with somewhat different vulva (Pl. XV. fig. 54).

Chelicera with 1–2 inferior and 3–4 superior teeth on inner margin.

Pedipalps of ♂.—Patella slightly longer than tibia (exclusive of the lateral process); lateral process of tibia longer than the rest of the joint; tarsus as long as the patella and tibia together with the lateral process; tarsal organ very like that of *M. fuliginea*, sp. n., but with the distal spine different (Pl. XV. fig. 55).

Length of trunk, ♀ ♀ 5 – $8\frac{1}{2}$, ♂ ♂ $4\frac{3}{4}$ – $6\frac{1}{2}$ mm.

(b) 3 ♀ ♀ from Worcester (*R. M. Lightfoot*).

10. *Melanophora caldaria*, sp. n.
(Pl. XV. figs. 56 & 57.)

Specimens.—2 ♀ ♀ and 1 ♂ from the Hot Baths at Montagu, collected by my wife and myself.

♀ ♀ (*types*).—*Colour* as in the preceding forms.

Eyes.—Anterior row strongly procurved, the lateral eyes considerably larger than the medians; posterior row straight, scarcely or not at all wider than the anterior row, the eyes equidistant, the laterals larger than the medians.

Chelicera with 4 superior but apparently only 1 inferior tooth on inner margin.

Two anterior pairs of *legs* without any spines below.

Vulva as in Pl. XV. fig. 56.

♂. *Pedipalps*.—Tibia short, its entire length (inclusive of the lateral process) being only about equal to that of the patella, the process forming about $\frac{1}{2}$ the whole length, the tarsus considerably longer than these two segments together; palpal organ with a long, fine, curved, black spine on outer side distally (Pl. XV. fig. 57).

Length of trunk, ♀ ♀ $5\frac{1}{3}$ – $5\frac{2}{3}$, ♂ $4\frac{3}{4}$ mm.

11. *Melanophora zonognathus*, sp. n.

(Pl. XV. figs. 58 & 59.)

Specimens.—4 ♀ ♀ and 4 ♂ ♂ from Eierfontein, 8–9 miles west of Hanover (S. C. Cronwright Schreiner).

♀ ♀.—*Abdomen* black; carapace and legs black to dark brown; underside and tarsi paler; the anterior pair of femora dark, without the large pale areas on outer and inner surfaces.

Eyes.—Anterior row procurved, the lateral eyes large, much larger than the small medians; posterior row wider, straight, the eyes equidistant, the laterals larger than the medians.

Labium and *maxillae* longish, the latter deeply emarginate on outer side.

Chelicera with 1 large and several smaller superior and 2–3 well-developed inferior teeth on inner margin.

Legs.—Metatarsus I unspined, II with a pair of basal spines below.

Vulva as in Pl. XV. fig. 58.

♂ ♂. *Pedipalps*.—Tibia (including lateral process) as long as the patella, the process small, shorter than the rest of the joint; tarsus longer than the two preceding joints together; palpal organ with long slender black spine arising distally on outer side and curving backwards and then forwards on lateral side (Pl. XV. fig. 59).

Length of trunk, ♀ ♀ $5\frac{1}{2}$ – $6\frac{1}{4}$, ♂ ♂ $4\frac{3}{4}$ – $6\frac{1}{4}$ mm.

12. *Melanophora humilis*, sp. n.

(Pl. XV. figs. 60 & 61.)

Specimens.—1 ♀ (type) and 1 ♂ from Ceres (W. F. P., October 1897).

Infuscated, the underside and the tarsi paler, the anterior pair of femora with large pale yellowish area on each side.

Eyes as in *M. zonognathus*, sp. n.

Chelicera with 2 inferior teeth.

Legs.—Anterior metatarsus with a pair of inferior spines.

Vulva of ♀ as in Pl. XV. fig. 60.

Pedipalps of ♂.—Tibia (exclusive of the process) slightly shorter than the patella, but inclusive of the process longer, the process shorter than the rest of the segment; tarsus shorter than the tibia and patella together; palpal organ as in Pl. XV. fig. 61.

Length, ♀ ♂, $2\frac{4}{5}$ mm.

13. *Melanophora O'Neili*, sp. n. (Pl. XV. fig. 62.)

Specimens.—2 ♀ ♀ from Dunbrody, Uitenhage Div. (Rev. J. A. O'Neil).

Colour.—Carapace and chelicera mahogany-brown to blackish red, the legs only slightly paler than the carapace. Abdomen infuscated or black, pallid below.

Eyes.—Anterior row procurved, the lateral eyes decidedly larger than the medians; posterior row almost straight (a trifle procurved), the medians smaller than the laterals and slightly nearer to the latter than to one another.

Labium and *maxillæ* as in *zonognathus*, sp. n.

Chelicera with 3 large superior but no inferior teeth.

Legs.—Metatarsi I and II unspined.

Vulva as in Pl. XV. fig. 62.

Length of trunk $5\frac{1}{4}$ –7 mm.

14. *Melanophora corragata*, sp. n.

(Pl. XV. figs. 63 & 64.)

Specimens.—(a) 16 ♀ ♀ and 2 ♂ ♂ from Hanover and 1 ♂ and 3 ♀ ♀ from Vlagkop and Eierfontein, near Hanover (S. C. Cronwright Schreiner).

♀ ♀. *Colour*.—Carapace and sternum light testaceous, the legs paler except the patella and tibia of I and the tibia of II, which are generally darker or more or less infuscated, the fourth tibia and metatarsus also often darkened. Abdomen more or less infuscated above, pale below, the scutellum of the ♂ testaceous.

Eyes rather large and conspicuous, the anterior row strongly procurved, the laterals largest; the posterior row wider than the anterior row and very slightly procurved, the medians oblique, very close together, a little larger than the laterals and much nearer to one another than to the latter; clypeus slightly shorter than the length of an anterior lateral eye.

Maxillæ broad at base, obtuse at apex, emarginate externally.

Chelicera with about 3 minute teeth on superior inner margin, but none on lower margin.

Legs stout, especially the femur, patella, and tibia of first pair; tibia I and II unspined below; metatarsus I unspined, II with 1 (rarely 0) outer and 2 inner, stout, short spines.

Vulva as in Pl. XV. fig. 63, with a large, transversely striated, anterior area.

♂ ♂. *Legs*.—Tibiæ I and II with 3-4 outer and 2-4 inner spines below, II with 1-3 upper spines as well; metatarsi I and II with 2 inferior pairs of spines, II with an inner superior spine as well.

Pedipalps.—Tibia together with its large process much longer than the patella; palpal organ as in Pl. XV. fig. 64, with a long slender black spine, which arises anteriorly and coils round the upper and outer side and ends on the lower surface.

Length of trunk, ♀ ♀ $4\frac{2}{3}$ -8, ♂ ♂ $5\frac{1}{2}$ mm.

(b) 1 ♀ from Kuruman in British Bechuanaland (*G. E. Beare*).

Very distinct from any of the species described above.

15. *Melanophora arida*, sp. n. (Pl. XV. fig. 65.)

Specimens.—1 ♀ and 1 juv. from Laingsburg, Prince Albert Div., collected by my wife and myself.

Very closely allied to the foregoing, but with the abdomen pallid above, the posterior row of eyes not wider than the anterior row, the posterior lateral eyes being nearer the medians (but further from them than the latter are from one another), the chelicera with a minute inferior tooth and 4-5 minute superior teeth on inner margin; tibia II with or without an inferior spine, and the vulva as in Pl. XV. fig. 65.

Length of trunk in ♀ $5\frac{1}{2}$ mm.

16. *Melanophora acanthognathus*, sp. n.

(Pl. XV. fig. 66.)

Specimens.—7 ♀ ♀ from Cape Town and the Cape Peninsula.

Colour testaceous, the legs sometimes somewhat darkened, the sternum bordered with black; the abdomen blackened, its ventral surface pallid, or, at least, paler.

Anterior row of *eyes* strongly procurved, the laterals larger than the medians, the clypeus longer than a lateral eye;

posterior row straight (scarcely procurved), slightly or scarcely at all wider than the anterior row; the eyes large, the medians triangular, larger than the laterals and slightly nearer to one another than to the laterals.

Chelicera with some superior but no inferior teeth on inner margin; the anterior surface densely covered with numerous longish spines.

Maxillæ obtuse, slightly emarginate externally, the labium shortish.

Legs.—Tibiæ I and II with 0-1 inferior spine; metatarsi I and II with two long bands of slenderer spines and generally also a basal pair of stouter spines below; tarsi I and II also furnished with two rows of small spines below and scopulate on each side.

Vulva as in Pl. XV. fig. 66.

Length 7-8½ mm.

EXPLANATION OF THE PLATES.

PLATE XIII.

- Fig. 1. Platyioides bidentatus*, sp. n., ♀. Vulva.
Fig. 2. Ditto, ♂. Tibia, tarsus, and palpal organ of left pedipalp from below.
Fig. 3. Platyioides quinquedentatus, sp. n., ♀. Vulva.
Fig. 4. Drassodes lophognathus, sp. n., ♂. Tibia and tarsus of right pedipalp from above.
Fig. 5. Ditto, ♂. Right palpal organ removed from the tarsus and seen obliquely from the medial side and below.
Fig. 6. Ditto, ♀. Vulva.
Fig. 7. Drassodes tessellatus, sp. n., ♀. Vulva.
Fig. 8. Ditto, ♂. Apex of process of right palpal organ in same position as in fig. 5.
Fig. 9. Drassodes solitarius, sp. n., ♀. Vulva.
Fig. 10. Drassodes caffreianus, sp. n., ♂. Distal part of right palpal organ in same position as in fig. 5.
Fig. 11. Drassodes calceatus, sp. n., ♀. Vulva.
Fig. 12. Drassodes Gooldi, sp. n., ♀. Vulva.
Fig. 13. Drassodes lyratus, sp. n., ♀. Vulva.
Fig. 14. Drassodes helenæ, sp. n., ♂. Right pedipalp from below.
 14 a. Distal process of palpal organ in same position as in fig. 5, to show the dorsal tooth.
Fig. 15. Drassodes Dregei, sp. n., ♀. Vulva.
Fig. 16. Drassodes ereptor, sp. n., ♀. Vulva.
Fig. 17. Ditto, ♂. Right pedipalp from below.
Fig. 18. Scotophæus relegatus, sp. n., ♂. Tibia of right pedipalp from outer side. 18 a. Tarsus and palpal organ of right pedipalp from below.
Fig. 19. Diaphractus Leipoldti, sp. n., ♀. Vulva.
Fig. 20. Xerophæus capensis, sp. n., ♂. Right pedipalp from outer side.
 20 a. ♀, vulva.
Fig. 21. Xerophæus dephnurus, sp. n., ♂. Tibia of right pedipalp from outer side.

PLATE XIV.

- Fig. 22. *Xerophæus interrogator*, sp. n., ♂. Tibia of right pedipalp from outer side.
 Fig. 23. *Xerophæus flavescens*, sp. n., ♂. Right pedipalp from below.
 Fig. 24. *Xerophæus spirifer*, sp. n., ♂. Right pedipalp from below.
 Fig. 25. Ditto, ♀. Vulva.
 Fig. 26. *Xerophæus aridus*, sp. n., ♀. Vulva.
 Fig. 27. *Xerophæus lunulifer*, sp. n., ♂. Right pedipalp from below.
 Fig. 28. Ditto, ♀. Vulva.
 Fig. 29. *Xerophæus spoliator*, sp. n., ♂. Right pedipalp from outer side.
 Fig. 30. Ditto, ♀. Vulva.
 Fig. 31. *Xerophæus Lightfooti*, sp. n., ♂. Right pedipalp from outer side.
 Fig. 32. Ditto, ♀. Vulva.
 Fig. 33. *Xerophæus communis*, sp. n., ♂. Tarsus and palpal organ of right pedipalp from below. 33 a. Tibia of right pedipalp from outer side.
 Fig. 34. Ditto, ♀. Vulva.
 Fig. 35. *Xerophæus aurariarum*, sp. n., ♂. Tarsus and palpal organ of right pedipalp from below.
 Fig. 36. Ditto, ♀. Vulva.
 Fig. 37. *Xerophæus eviguis*, sp. n., ♂. Tarsus and palpal organ of right pedipalp from below. 37 a. Tibia of right pedipalp from outer side.
 Fig. 38. *Xerophæus rostratus*, sp. n., ♂. Tibia of right pedipalp from outer side. 38 a. Tarsus and palpal organ of right pedipalp from below.
 Fig. 39. Ditto, ♀. Vulva.

PLATE XV.

- Fig. 40. *Xerophæus crustosus*, sp. n., ♂. Tarsus and palpal organ of right pedipalp from below.
 Fig. 41. *Xerophæus appendiculatus*, sp. n., ♂. Right pedipalp from below.
 Fig. 42. Ditto, ♀. Vulva.
 Fig. 43. *Xerophæus Patricki*, sp. n., ♂. Tarsus and palpal organ of right pedipalp from below.
 Fig. 44. *Melanophora fuliginea*, sp. n., ♀. Vulva.
 Fig. 45. Ditto, ♂. Tarsus and palpal organ of right pedipalp from below.
 Fig. 46. Ditto, ♂. Distal part of right palpal organ from outer side with the tarsus removed.
 Fig. 47. *Melanophora invida*, sp. n., ♀. Vulva.
 Fig. 48. *Melanophora Lightfooti*, sp. n., ♀. Vulva.
 Fig. 49. *Melanophora Simoni*, sp. n., ♀. Vulva.
 Fig. 50. *Melanophora redunca*, sp. n., ♀. Vulva.
 Fig. 51. *Melanophora montana*, sp. n., ♀. Vulva.
 Fig. 52. *Melanophora Broomi*, sp. n., ♀. Vulva.
 Fig. 53. *Melanophora Gooldi*, sp. n., ♀. Vulva.
 Fig. 54. *Melanophora Cronwrighti*, sp. n., ♀. Vulva.
 Fig. 55. Ditto, ♂. Right palpal organ from outer side, removed from the tarsus.
 Fig. 56. *Melanophora caldaria*, sp. n., ♀. Vulva.
 Fig. 57. Ditto, ♂. Right palpal organ from outer side, removed from the tarsus.

Fig. 58. *Melanophora zonognathus*, sp. n., ♀. Vulva.

Fig. 59. Ditto, ♂. Tarsus and palpal organ of right pedipalp from below.

Fig. 60. *Melanophora humilis*, sp. n., ♀. Vulva.

Fig. 61. Ditto, ♂. Tarsus and palpal organ of right pedipalp from below.

Fig. 62. *Melanophora O'Neili*, sp. n., ♀. Vulva.

Fig. 63. *Melanophora corrugata*, sp. n., ♀. Vulva.

Fig. 64. Ditto, ♂. Right pedipalp from below.

Fig. 65. *Melanophora arida*, sp. n., ♀. Vulva.

Fig. 66. *Melanophora acanthognathus*, sp. n., ♀. Vulva.

XLIII.—*Descriptions of Two new African Species of Barbus.*

By G. A. BOULENGER, F.R.S.

THE paradoxical section of Barbels without barbels (*Systomus*, McClelland, Bleeker), long believed to be restricted to South-eastern Asia, has, within the present century, received several additions from Africa. Two further species are here described, bringing the number of African species up to eight, which may be distinguished by means of the following key:—

A. Lateral line complete.

- Sc. 20-32 $\frac{5\frac{1}{2}}{3\frac{1}{2}}$; depth of body $3\frac{1}{2}$ to $3\frac{3}{4}$ times in total length; caudal peduncle twice as long as deep [1906 (L. Victoria).
B. Magdalene, Blgr.,
- Sc. 28 $\frac{3\frac{1}{2}}{3\frac{1}{2}}$; depth of body 3 times in total length; caudal peduncle once and $\frac{1}{2}$ as long as deep [1902 (Congo).
B. Brazza, Pellegr.,
- Sc. 25 $\frac{3\frac{1}{2}}{3\frac{1}{2}}$; depth of body $2\frac{1}{2}$ times in total length; caudal peduncle as long as deep. [(S. Cameroon).
B. aspilus, sp. n.
- Sc. 22-25 $\frac{3\frac{1}{2}-4\frac{1}{2}}{3\frac{1}{2}}$; depth of body $2\frac{2}{3}$ to $3\frac{1}{3}$ times in total length; caudal peduncle not or but slightly longer than deep [(Nile).
B. anema, Blgr., 1903
- Sc. 23 $\frac{3\frac{1}{2}}{3\frac{1}{2}}$; depth of body $3\frac{1}{2}$ times in total length; caudal peduncle once and $\frac{1}{2}$ as long as deep [(Congo?).
B. trispilomimus, sp. n.

B. Lateral line absent or reduced to a few tubules; depth of body equal or nearly equal to length of head, 3 to $3\frac{1}{2}$ times in total length.

- Sc. 22-25 $\frac{3\frac{1}{2}-4\frac{1}{2}}{2\frac{1}{2}-3\frac{1}{2}}$; origin of dorsal midway between end of snout and root of caudal [1903 (Nile).
B. stigmatopygus, Blgr.,
- Sc. 20-23 $\frac{3\frac{1}{2}}{3\frac{1}{2}}$; origin of dorsal nearer end of snout than caudal [(S. Cameroon).
B. Jæ, Blgr., 1903
- Sc. 19-20 $\frac{3\frac{1}{2}}{2\frac{1}{2}}$; origin of dorsal midway between end of snout and root of caudal. [(Nile).
B. pumilus, Blgr., 1901

Barbus aspilus.

Depth of body $2\frac{1}{2}$ times in total length, length of head 4 times. Snout rounded, a little shorter than the eye, the diameter of which is $\frac{3}{2}$ times in length of head and equals interorbital width; mouth small, subinferior, with moderately developed lips; no barbels. Dorsal III 8; last simple ray not ossified, once and $\frac{1}{3}$ as long as head; the border of the fin slightly emarginate, its origin nearer end of snout than root of caudal. Anal III 5. Pectoral a little shorter than head, reaching ventral; latter a little behind vertical of origin of dorsal. Caudal forked. Caudal peduncle nearly as deep as long. Scales $25\frac{3\frac{1}{2}}{3\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Yellowish brown above, the scales dark brown at the base, silvery below; no markings.

Total length 125 mm.

A single specimen from the Ja River, S. Cameroon (Coll. G. L. Bates).

Barbus trispilomimus.

Depth of body $3\frac{1}{4}$ times in total length, length of head 3 times. Snout rounded, projecting beyond the mouth, shorter than the eye, the diameter of which is $2\frac{3}{4}$ times in length of head and equals interorbital width; mouth small, with thin lips; no barbels. Dorsal III 8, last simple ray not ossified, as long as head, the border of the fin not emarginate, its origin midway between end of snout and root of caudal. Anal III 5. Pectoral shorter than head, not reaching ventral; latter below middle of dorsal. Caudal forked. Caudal peduncle once and a half as long as deep. Scales $23\frac{3\frac{1}{2}}{3\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral, 8 round caudal peduncle. Pale brownish above, silvery below; three large round black spots on each side of the body, on the lateral line, the first in front of the vertical of the dorsal, the second behind the vertical of the dorsal, the third in front of the caudal; two small black spots at the base of the dorsal.

Total length 35 mm.

The locality of this fish, which strikingly resembles *B. trispilus*, Blkr., in form and markings, is unknown. The single specimen was found in an unlabelled jar containing examples of *Clariallabes melas*, Blgr., and *Channallabes apus*, Gthr. It therefore probably comes from the Congo.

XLIV.—Description of a new Pit-Viper from Brazil.

By G. A. BOULENGER, F.R.S.

Lachesis itapetiningæ.

Snout obtusely pointed, with strong, slightly raised canthus. Rostral a little deeper than broad; nasal divided; upper head-scales small, imbricate, strongly keeled; supraocular large, separated from its fellow by 7 to 9 longitudinal series of scales; internasals large and in contact with each other; a large canthal; two or three postoculars and a subocular, which is separated from the labials by one series of scales; loreal pit separated from the labials; temporal scales keeled; 8 upper labials, third and fourth largest. Scales strongly keeled, in 25 rows. Ventrals 150–152; anal entire; subcaudals 28–29. Pale reddish brown above, with large transversely oval or quadrangular dark light-edged spots disposed in two alternating series, some of the spots of the two sides meeting on the middle line of the back, others, on the sides, broken up into two or more; sides of snout whitish; a broad oblique dark band below the eye; a transversely oval dark spot on the upper surface of the snout, and a wavy dark band, continuous or interrupted, on each side of the top of the head from the interocular region to the nape; belly white, much speckled or blotched with brown, the white of the lower parts sometimes sharply defined from the brown of the upper, on the lower row of scales.

Total length 400 mm.; tail 55.

Two specimens, females, from Itapetininga, a city in the State of São Paulo. The British Museum is indebted for these specimens to Dr. Vital Brasil, Director of the Serum-therapeutic Institute of S. Paulo, who recognized them as belonging to a distinct species, remarkable for its small size, the above-described specimens being the largest obtained so far. The name *Lachesis itapetiningæ* was suggested to me by Dr. Vital Brasil.

This *Lachesis itapetiningæ* is nearly related to *L. Neuwiedii*, Wagl., from which it is easily distinguished by its stouter form, as expressed by the lower number of ventral and caudal shields.

Among other specimens of *Lachesis* from the State of São Paulo I was pleased to examine one of the "Jararacuçu," a remarkable variety of *L. lanceolatus* growing to a length of over 2 metres, the pattern of coloration of which has been figured by Jan (Icon. Ophid. xlvii. pl. ii. fig. 3). It agrees entirely in structure with the true "Fer-de-Lance," with which it is completely connected by intermediate patterns of coloration.

XLV.—On new Species of Histeridæ and Notices of others.

By G. LEWIS, F.L.S.

MARSEUL, in his Monograph, collated descriptions of species other than his own for the sake of easy reference, and I have from time to time followed his example. In this, the thirty-second paper of the series, I have introduced a few more.

List of Species.

| | |
|-----------------------------|----------------------------|
| Teretriosoma argentinum. | Hister falsus, Sols. |
| Eutidium peruanum. | — Bruchi. |
| Teretrius montanus, Horn. | — foveicollis. |
| — levatus, Horn. | Grammostethus socius. |
| Sternaulax caledoniæ, Fauv. | Atholus atricolor. |
| Apobletes angolensis, Lew. | Epitoxus felix. |
| — Migneauxi, Mars., | Microlomalus filum, Reitt. |
| — =foliaceus, Payk. | Pachycærus montanus, Lew. |
| Platysoma connexum, Fauv. | — nanus. |
| — Simeani, Muls. & God. | Paratropus aptistrius. |
| Silinus, gen. nov. | Homalopygus latisternus. |
| Zabromorphus deflexus. | Murexus, gen. nov. |
| Hister subsulcatus, Mars., | Saprinus sparsutus, Sols. |
| — =hottentotta, Er. | — lateristrius, Sols. |
| — turanus, Sols. | |

Teretriosoma argentinum, sp. n.

Cylindricum, subelongatum, obscure æneum, undique sat dense punctulatum; antennis pedibusque rufo-brunneis; elytris transversim basi impressis; mesosterno stria marginali prave integra; tibiis anticis 7-denticulatis.

L. $2\frac{1}{4}$ mill.

Cylindrical, somewhat elongate, faintly coppery, clearly but not very closely punctured above; the head sometimes has a small fovea on its vertex which may be sexual; the thorax, the lateral stria continues behind the head; the elytra are impressed transversely behind the anterior angles; the pygidium is slightly convex and with the propygidium is clearly punctulate like the upper surface; the sterna are microscopically strigose, with punctures evenly and not closely set; the prosternal keel is arched at the base and anteriorly the marginal rim is very narrow; the mesosternum is obtusely produced anteriorly and the marginal stria is apparently complete but irregular, owing to the interposition of punctures; the metasternum has a well-marked lateral stria which turns outwards from the anterior edge; the legs

and antennæ are reddish brown, anterior tibiæ with seven denticulations.

This species is more cylindrical and elongate than any other known. There are now nearly forty species of this genus described, and others exist in collections, and they are very difficult to characterize intelligently.

Hab. Argentina, Province of Buenos Aires (*H. Richter*).

Eutidium peruanum, sp. n.

Oblongo-ovatum, convexiusculum, nigrum, nitidum: fronte plana haud striata; pronoto impunctato; elytris striis 1-2 brevibus, cæteris nullis; pygidio grosse punctato, apice transversim lævi. L. $6\frac{3}{4}$ mill. (absque mandibulis).

Oblong-oval, slightly convex, black and shining; the forehead is not striate, but in certain lights transverse impressions may be seen which apparently correspond to striæ; the thorax is laterally impunctate; the elytra, striæ 1-2 are basal and very short, the outer one longest; the propygidium is sparsely punctate on its lateral edges and rather widely biimpressed apically; the pygidium is coarsely punctured, with the posterior margin smooth; the prosternal keel is narrowed before the coxæ.

The large size, the more oblong form, and the coarse punctuation of the pygidium distinguish this species from the other four known.

Hab. Peru.

Teretrius [*Teretriosoma*?] *montanus*, Horn, Tr. Amer. Ent. Soc. viii. p. 143 (1880).

"Black, shining. Thorax a little wider than long, rather finely punctate, the punctures denser in front. Elytra not more densely punctured than the posterior portion of the thorax. Prosternum sparsely punctate, the tip distinctly grooved. Mesosternum sparsely and finely punctate, without marginal line. Anterior tibiæ rather strongly bidentate at middle, the posterior bispinose near the tip.

"Length .10 inch (2.5 mm.).

"*Hab.* Colorado.

"Of the same form as *americanus* [*Teretriosoma*], but larger and with different dentate tibiæ."

Teretrius levatus, Horn, Proc. Calif. Ac. iv. p. 365 (1894).

"Cylindrical, piceous black, shining; legs brown. Head finely, not closely punctate. Thorax sparsely punctate, fine

at apex and sides, coarser near base. Elytra more coarsely punctate, the punctures finer near sides than on apex; a smooth umbonal space; a short very oblique stria at base. Pygidium sparsely punctate. Mesosternum distinctly margined in front, sparsely and coarsely punctured. Anterior tibiæ 4-denticulate; middle tibiæ 4-spinose; hind tibiæ bi-spinose near apex, with a smaller spine at middle.

"Length .10 inch (2.5 mm.).

"Resembles *obliquulus*, but much smaller [the measurement given is .10 inch for both species], and with one less spine on the middle and hind tibia, the spines being at the same time more slender.

"*Hab.* San José del Cabo, Lower California."

Sternaulax caledonicæ, Fauv. Rev. d'Ent. x. p. 164 (1891).

Fauvel in his description of this species points out the differences between it and *zealandica*, Mars.:—

"Voisin du *zealandica*, Mars., mais distinct surtout par la disposition du stries; celle de la tête, presque complète en avant; celle du corselet plus forte et entière jusqu'au milieu; la 2^a dorsale des élytres très nette, bien que raccourcie; le propygidium plus finement ponctué, entouré d'un rebord cariniforme."

The anterior femora of Marseul's species are also more markedly punctate.

L. 9 mill.

Hab. New Caledonia.

Apobletes angolensis, Lew. Ent. Mag. xvi. p. 76 (1879).

Oblongo-ovalis, complanatus, nigro-piceus, nitidus; fronte plana, stria fere recta; pronoto stria marginali antice late interrupta, interna tenuiter impressa, obliqua, margine distanti; elytris striis 1-3 integris, cæteris nullis; propygidio transversim punctato; pygidio grosse punctato, margine postice elevato; prosterno haud striato; mesosterno stria integra, utrinque valde impressa.

L. 5-6 mill.

Hab. Angola, Congo River, and Togoland.

Apobletes Migneauxi, Mars. (1860), = *A. foliaceus*, Payk. (1811), syn. n.

The species I referred to in a note (Ann. & Mag. Nat. Hist. vii. p. 241, 1901) with a complete mesosternal stria is undescribed at present, as I do not know its habitat.

Platysoma connexum, Fauv. Rev. d'Ent. x. p. 166 (1891).

"Forma plana, striis elytrorum structuraque pygidii ut in *latisterno*, Mars., conformatis, sed pronoti lateribus minus distincte punctulatis, stria laterali marginali conjuncta, hac margine apicali haud interrupta, prosterno minus lato, mesosterno toto marginato, antice arcuatim profundius sinuato, sine linea inter hoc et metasternum bene perspicua sat facile distinguendum."

L. 4 mill.

Hab. New Caledonia.

I copy Fauvel's description of the above, as I apparently erroneously placed *P. connexum* as a synonym of *P. Montrouzieri*, Mars., in the Catalogue of 1905.

Platysoma Simeani, Mulsant & Godart, Ann. Soc. Linn.

Lyon, xxi. p. 420 (1874).

"Oblong, noir, brillant; antennes et pattes brunâtres; strie frontale entière; prothorax quadrangulaire; élytres à trois stries marginales entières; les trois suivantes raccourcies; pygidium couvert de gros points ocelles; tous les tarses [tibiæ] tridentés."

Mulsant also says that the prosternum is bordered with a stria, but this refers to the anterior lobe, not to the keel. The anterior tibiæ are 3-dentate, but the others are 4-spinose.

The head is finely punctulate anteriorly and somewhat coarsely punctured behind, the frontal stria is strong and widely transverse in front, not quite straight, and continues well-marked over the eye; the lateral stria is very similar to that of *Confucii*, Mars., but it continues a little round the posterior angle and behind the neck it widens a little away from the edge and is feebly and irregularly crenate, surface lightly punctulate, especially laterally; the pygidia are closely ocellately punctured; the mesosternum is rather widely sinuous anteriorly, but the marginal stria is bisinuous and fine and not very close to the edge, and it is broken at the suture, not joining the metasternal lateral stria. The elytra, as Mulsant says, have the 1-3 dorsal complete, 4-5 and sutural not quite dimidiate, the fourth and fifth (the shortest) are rather shorter than the sutural. The outer humeral stria is fine and complete, and continues along the apical margin to a point opposite the sutural stria.

The form of the humeral stria will serve to identify this species from others known.

Hab. Beirut, Syria, "sous l'écorce d'un olivier."

SILINUS, gen. nov.

Body elongate, somewhat cylindrical, but a little depressed; the head impressed, frontal stria complete, mandibles more or less canaliculate at the base, antennal fossa circular and open; thoracic marginal stria complete and partly or wholly continued along the base; elytral striæ 1-4 complete, 5 dimidiate, sutural wanting or very faintly marked; propygidium punctate; pygidium smooth at the apex or marginate; prosternum sometimes striate; mesosternum emarginate, stria complete; all the tibiæ dilated.

The species known have hitherto been placed in *Platylister*, and are *pinnigera* (type), *palmipes*, and *extrarius*, Lew., and *robustus*, Sch. The frontal stria in the last is very deep and the thoracic stria is simply "complete," not, in the usual sense of this term, passing along the base. In other respects *extrarius* and *robustus* are, judging by the descriptions, very similar.

Zabromorphus deflexus, sp. n.

Ovalis, convexus, niger, nitidus; pronoto striis 2 lateralibus integris; elytris striis dorsalibus 1-2 integris, 3 dimidiata, cæteris nullis; propygidio pygidioque dense punctatis; mesosterno truncato, marginato.

L. 8-8 $\frac{1}{4}$ mill.

Oval, convex, black and shining, surface very finely punctulate; the head, frontal stria complete and nearly straight anteriorly; the thorax, inner lateral stria complete and continues behind the head and is markedly deflected near the eye, outer lateral ceases after passing the anterior angle, behind the angle the outer interspace has some irregular marks which seem to be the rudiments of a third lateral stria, these marks vary in individuals; the elytra, inner humeral apical dimidiate, somewhat faint and broken at intervals, 1-2 dorsal complete, 3 basal but reaching the middle and it is somewhat irregular and lightly impressed, the other dorsal striæ are wanting, but there are impressions and punctures along the apical margin which apparently represent appendages; the pygidia are densely punctured; the mesosternum is truncate and the marginal stria complete; the anterior tibiæ are 3-dentate and the anterior femora clearly punctured.

The peculiar dorsal striation will serve to distinguish this species.

Hab. Isansu, German East Africa.

Hister subsulcatus, Mars. (1854), = *H. hottentotta*, Er. (1834), syn. n.

Hister turanus, Sols. Reise Fedtsch. Turkest.,
Col. ii. p. 223 (1876).

"Subquadrato-ovatus, convexus, niger, nitidus, antennis piceis; fronte biimpressa, stria integra, antice recta; pronoto transverso, antrorsum parum angustato, utrinque breviter ciliato et bistriato, striis integris; elytris striis dorsalibus 1-3 integris, 4 parum abbreviata, haud appendiculata; margine inflexo impresso, bistriato, lævi; propygidio basi disperse, minus subtiliter punctato, apice lævi, pygidio sat crebre subtilius punctato; prosterno apice rotundato; mesosterno lato, sat profunde sinuato, stria integra; tibiis anticis valide 3-dentatis, dente apicali bilobo, posticis biserialim 5-6-denticulato-spinosis.
"L. $2\frac{2}{3}$."

"*Hab.* In valle Sarafschan, specimen unicum."

The above is Solsky's diagnosis, and there is more in the Russian language descriptive of the species.

Hister falsus, Sols. Reise Fedtsch. Turkest.,
Col. ii. p. 229 (1876).

"Oblongus, subquadrato-ovatus, convexus, niger, nitidus, supra obsolete, subtiliter punctulatus, antennis rufo-brunneis, basi nigricantibus. Stria frontali antice recta, medio subsinuata; mandibulis supra plana, subtiliter rugulosus. Pronoto antrorsum parum angustato, stria laterali interna integra, externa ante medium abbreviata. Elytris thorace longioribus, stria subhumerali nulla, 1-3 dorsalibus integris, lævibus, 4-6 abbreviatis, apicalibus, 5 fere nulla, 6 dimidiata; fossa marginali lævi bistriata. Propygidio pygidioque minus crebre punctatis, illic apice lævigato. Mesosterno apice emarginato, stria integra. Tibiis anticis quadridentatis, dente apicali bilobo, posticis 7-8-spinoso-denticulatis.

"Var. striis 4 et 5 dorsalibus omino deletis.

"Long. 6, lat. $4\frac{1}{5}$ mill."

"Ad Maracandam." Turkestan.

Hister Bruchi, sp. n.

Ovatus, convexus, niger, nitidus; fronte haud impressa, stria antice recta; pronoto stria interna integra, externa brevi; elytris striis 1-3 integris, 4-5 apicalibus, suturali medium versus abbreviata; pygidio tenuissime punctulato; mesosterno marginato, antice sinuato; tibiis anticis 5-dentatis.

Oval, convex, black and shining; the head very finely punctulate, stria complete and straight anteriorly, forehead not impressed; the thorax, inner lateral stria complete, outer short and almost confined to the angle; the elytra, striæ, outer humeral short and just before the middle, inner well-marked apical and slightly overlaps the outer stria, 1-3 complete, 4-5 very short and apical, sutural is much shortened anteriorly; the pygidia are very finely punctulate (like those of *cavifrons*, Mars.); the mesosternum is slightly sinuous and marginate anteriorly; the anterior tibiæ are 5-dentate.

This species belongs to a section of the genus peculiarly American.

Hub. Argentina, Province Salta and Tucuman (*C. Bruch* and *G. A. Baer*).

Hister foveicollis, sp. n.

Ovalis, convexiusculus, niger, nitidus; fronte plana, stria semicirculari; pronoto in medio bifoveolato; elytris striis 1-4 dorsalibus integris, 5 et suturali abbreviatis; propygidio bifoveolato pygidioque punctulatis.

L. $5\frac{1}{2}$ -6 mill.

Oval, slightly oblong, somewhat convex, black and shining; the forehead plane, not impressed, stria complete and semicircular, surface very finely punctulate; the thorax also very finely punctulate, with two discal foveæ separated by about the width of the head, inner lateral stria complete, outer dimidiate or sometimes longer; the elytra, striæ, inner humeral shortened one third at the base, dorsal 1-4 complete, 5 nearly dimidiate, sutural one third longer; the propygidium and pygidium very finely punctulate, the first has two shallow foveæ near the outer edge; the mesosternum emarginate, stria complete; the anterior tibiæ 5-6-dentate.

This species is rather more oblong than *H. punctifer*, Payk., but it is otherwise very similar. The thoracic foveæ are very peculiar, and had I only a single example I should have considered them incidental.

Hab. Brazil, Minas, Serra de Diamantina (*E. Gounelle*); three examples.

Grammostethus socius, sp. n.

Ovalis, convexiusculus, niger, nitidus; fronte minute punctulata, stria arcuata, integra; elytris striis 1-4 integris, 5 et suturali dimidiatis; prosterno striis posticis abbreviatis.

L. 4 mill.

Oval, somewhat convex, black and shining; the forehead minutely punctulate, stria complete and rather widely arched; the thorax very finely punctulate, inner stria complete and minutely crenate behind the head, outer stria wanting; the elytra, outer humeral stria basal, curved and dimidiate, inner stria wanting, dorsal 1-4 complete, 5 and sutural nearly equal, but the sutural just passes the middle; the pygidia are clearly not closely punctured; the prosternum, the striæ are short and do not pass between the coxæ; the basal lobe is impressed; the mesosternum is truncate, stria complete and close to the edge; the anterior tibiæ are 5-6-denticulate.

The fourth dorsal stria in this species is complete, but this does not seem to be an important character in the genus, as in some not otherwise dissimilar species (e. g. *fractistrius*, Lew. Ann. & Mag. Nat. Hist. xvii. p. 342, 1906) the fourth stria is sometimes complete on one side and not on the other.

Hab. Kashmir, North India.

Atholus atricolor, sp. n.

Ovalis, convexiusculus, niger, nitidus; fronte stria integra, antice leviter biimpressa; pronoto stria externa abbreviata, interna integra; elytris striis 1-4 validis, integris, 5 apicali, suturali basi paululum abbreviata; propygidio aliquantum grosse punctato; tibiis anticis 4-dentatis.

L. $3\frac{3}{4}$ -4 mill.

Oval, somewhat convex, black and shining; the head, mandibles canaliculate, stria complete, strong at the sides, feebly sinuous anteriorly, with two circular impressions behind it, surface punctulate; the thorax, outer lateral stria short, passing from the anterior angle nearly halfway along the side, inner stria rather strong and complete, crenate behind the neck; the elytra, striæ, inner humeral strong, apical, and reaching just beyond the middle, dorsal 1-4 also strong and complete, 5 apical and not quite reaching the middle, sutural shortened a little at the base and turning slightly from the suture at both ends; the propygidium is coarsely, evenly, and not densely punctate, on the pygidium the punctures are smaller; the prosternum is narrow between the coxæ; the mesosternum, marginal stria complete and close to the anterior edge, slightly broken at the suture, not quite joining the metasternal stria; the anterior tibiæ are 4-dentate.

Hab. Mashonaland (Guy A. K. Marshall).

A stercoraceous species which sometimes flies to light.

Epitoxus felix, sp. n.

Suborbicularis, convexus, niger, nitidus; fronte plana tenuissimo punctulata, stria semicirculari integra; pronoto lateribus punctato, ante scutellum transversim rugose punctato; elytris striis 1-2 subintegris, 3 integris sinuatis, 4 fere dimidiata, 5 obsoleta, suturali integris basi arcuata; tibiis anticis multispinosis.

L. 3 mill.

Nearly orbicular in outline, convex, black and shining; the legs and antennæ dark brown; the head, surface with an extremely fine punctuation, stria semicircular; the thorax, marginal stria complete and finely crenulate behind the head, disk almost smooth, outer area rather coarsely but not densely punctured, the scutellar impression is transverse and narrow and somewhat rugosely punctured; the elytra, striæ, outer humeral apical and nearly dimidiate, 1 dorsal a little shortened apically, 2 a little shortened at the base, 3 complete, slightly sinuous, 5 indicated only by two or three apical punctures, sutural complete but very fine before the base, seen only in certain lights to join an appendage to the fourth stria; the pygidia are clearly, not densely, punctured, and the points vary in size and are fewer near the apices; the prosternum is sparingly and evenly punctured, stria well-marked laterally, but very fine along the base and not quite joining anteriorly; the mesosternum is impunctate, marginal and transverse striæ well-marked and crenulate; the anterior tibiæ are 9-10-spinose.

The epipleuræ of the species in this genus are bistrate.

Hab. Usambara, East Africa.

Microlomalus (Paromalus) filum, Reitt. Deutsche ent. Zeitschr. xxviii. p. 256 (1884).

“Prosternum antrorsum angustum, obtuse carinatum, striis lateribus non impressum, postice rotundatum lobatum, subdeplanatum. Metasternum valde elongatum, in medio maris longitudinaliter, minus profunde sulcatum. Tibiis leviter curvatis, angustis, intermediis subtiliter tridentatis, anticis dilatatis (magis curvatis), extus parce denticulatis, apice extus oblique truncatis.”

Hab. Bulgaria.

Pachycærus montanus, Lewis (1907).

Oblongus, subeylindricus, viridi-cyaneus, nitidus; fronte impressa, stria integra; pronoto stria marginali antice late interrupta; elytris striis 1-4 integris, 5 obsoleta, suturali dimidiata; pro-pygidio pygidioque fortius vix dense punctatis; prosterno

bistriato, striis rectis haud conjunctis; mesosterno antice immarginato; tibiis anticis 6-dentatis.

L. $5\frac{1}{2}$ –6 mill.

Oblong, somewhat cylindrical, greenish blue and shining; the head slightly impressed anteriorly; marginal stria complete, surface microscopically punctulate; the thorax, marginal stria is widely interrupted behind the head, the disk before the scutellum is almost smooth, but behind the head and laterally it is conspicuously punctate; the elytra, striæ, outer humeral fine bent and reaching the middle from the apex, 1–4 complete, 5 short and apical or wanting, sutural apical well-marked and reaching just beyond the middle; the pygidia are closely and somewhat coarsely punctate; the prosternum bistriate, striæ straight and not joining at either end and do not quite reach the base; the mesosternum is somewhat acute and immarginate anteriorly; the anterior tibiæ 6-dentate.

In form and colour this species somewhat resembles *P. Rajfrayi*, Lew., but it is slightly greener and being broader is a little less cylindrical.

Hab. Kilimanjaro (*Sjöstedt*). Two examples.

Pachycærus nanus, sp. n.

Oblongus, parum convexus, subniger, nitidus, pedibus rufo-brunneis; fronte stria utrinque angulata, antice late interrupta; propygidio parum grosse punctato; mesosterno stria transversa arcuata, stria marginali late interrupta.

L. $2\frac{1}{2}$ mill.

Oblong, rather convex, nearly black and shining, legs and antennæ reddish brown; the head very feebly impressed anteriorly, surface with punctures of varying sizes not closely set, stria angulate near the eye, oblique anteriorly and abruptly shortened; the thorax, marginal stria fine and not passing behind the neck, punctuation not close and consisting of somewhat large points and fine ones intermixed; the elytra, outer humeral stria fine and complete, inner short and nearly median, 1–4 dorsal complete, 5 wanting, sutural a little shortened at both ends, apices very sparingly punctured; the propygidium is somewhat coarsely, but not closely punctured; the pygidium, punctures much smaller and fewer; the prosternum is bistriate, striæ sinuous and not joining at either end, keel moderately broad; the mesosternum is bisinuous anteriorly, not pointed, and the marginal stria is widely interrupted, the transverse stria is detached and in the form of an arc, with a few irregular notches along the

edges, it is anterior to the suture; the anterior tibiæ are 5-6-denticulate.

The small stature and the singular frontal and mesosternal striae distinguish this species from the others known.

Hab. Togo-land.

Paratropus aptistrius, sp. n.

Ovatus, brunneus, tenuissime punctulatus, subnitidus; fronte stria marginali integra, utrinque carinata; pronoto anguste marginato; elytris striis 1-4 et suturali integris, 4 arcu basali suturali cœunte, 5 ultra medium abbreviata; prosterno angusto, bistriato. L. $3\frac{1}{2}$ mill.

Oval, brown, somewhat shining, surface microscopically punctulate; the head convex on vertex, frontal stria complete, angulate before the eyes and carinate especially laterally and by the angles; the thorax is narrowly marginate; the elytra, striæ, humeral strong and complete, 1-4 and sutural finer and also complete, 4 and sutural join at the base, 5 is shortened before the middle; the pygidia are feebly punctulate; the prosternum, the keel is narrow and bistrate, striæ parallel until just behind the anterior lobe, where they turn outwards; the mesosternum is sparingly punctulate, bistrate anteriorly, with a crenate straight stria over the suture.

This species is extremely similar to *ovides*, Mars., but the fourth and sutural striæ are complete and join anteriorly and the surface is not "lævis nitidus," owing to a fine though sparing punctuation and a roughened sculpture seen under the microscope.

Hab. Portuguese Guinea.

Homalopygus latisternus, sp. n.

Oblongus, depressus, piceus, nitidus; fronte tenuiter punctulata; pronoto ad angulos tristriato; elytris striis dorsalibus abbreviatis; pygidio basi excavato; prosterno lato, impunctato; mesosterno profunde inciso. L. $2\frac{1}{2}$ mill.

Oblong, rather depressed, piceous, shining; the head, surface uneven, free, finely punctulate and densely microscopically strigose; the thorax, marginal stria fine and interrupted behind the neck, the anterior angles are somewhat impressed, at the basal angle there is a fine short stria and close to it are two longer striæ also very fine and bent and pointing towards the head; the elytra, striæ very fine, inner humeral complete, 1 dorsal indistinct, 2-3 fine, basal, but well-marked, 4 a little longer and joined to the sutural stria,

which is complete and on the dorsal disk geminate; the propygidium is finely not closely punctured; the pygidium is triangularly excavated at the base; the prosternum, the keel is rather wide (twice the width of that of *remex*, Lew.), and the striae are feebly sinuous between the coxae and are widely separate at both ends; the mesosternum is very deeply incised on either side of the projection, which is somewhat large and obtuse, the marginal stria is fine and complete, but does not follow the anterior edge closely.

In outline the above is similar to *H. remex*, Lew., but the thoracic and dorsal striae are very different, and the excavated pygidium and the width of the prosternal keel also distinguish it from *remex*.

Hab. Jatahy, Province of Goyaz, Brazil.

MUREXUS, gen. nov.

Body oblong and with the legs densely muricate, forehead convex; thorax explanate laterally and anteriorly cut out in semicircular outline; elytra costate; prosternum roughly carinate, anterior lobe tuberculate; mesosternum bisinuous; legs elongate, tibiae angulate on the outer edge. Type *Terapus muricatus*, Lew. Ann. & Mag. Nat. Hist. vi. p. 286, pl. 10. fig. 2 (1900).

The above characters are selected from those drawn for a single species; at present only *Terapus Mniszechi*, Mars., and *bicarinatus*, Lew., are properly referable to *Terapus*. *T. Mar-seuli*, Westw., more nearly resembles a species of *Tylois*, but it has no mesosternal tubercles: Westwood's figure, 'Thesaurus Ent. Oxon.' p. 67, tab. 67. f. 9 (1874), is of course excellent.

Saprinus sparsutus, Sols. Reise Fedtsch. Turkest.,
Col. i. p. 238 (1876).

Saprinus brunnensis, Fleicher, Wien. ent. Zeit. ii. p. 179 (1883).

"*Saprinus tenuistrius*, Mars., affinis, subquadrato-ovatus breviusculus, nitidus, niger, clytris apice picescentibus, pedibus antennisque piceis, his clava ferruginea. Fronte crebre punctulata, stria nulla. Thorace medio subtilissime disperse punctato, lateribus fortius et crebre ruguloso-punctato, longitudinaliter impresso, impressione paulo ante angulum posteriorem fovea oblonga, margini approximata, terminata, foveolis postocularibus distinctis. Elytris undique punctulatis, punctis circa scutellum subtilioribus, magis dispersis, postice fortioribus, sat crebris; stria suturali integra, basi cum 4 dorsali conjuncta, stria dorsalibus in medio abbreviatis; stria humerali postice abbreviata, cum subhumerali interna haud

conjuncta, subhumerali externa brevi, basali. Pygidio sat crebre punctato. Prosterno striis convergentibus, stria mesosternali integra. Tibiis anticis 5-6-denticulatis.

"Long. $4\frac{1}{4}$, lat. 3 mill.

"In valle Sarafschan." Turkestan.

Saprinus lateristrius, Sols. Reise Fedsch. Turkest.,

Col. ii. p. 240 (1876).

"Oblongo-ovatus, convexus, picco-niger, nitidus, antennis pedibusque piceis, his rufescentibus. Capite subtiliter, minus dense punctulato, fronte antice transversim impressa et utrinque subcarinata, stria frontali medio interrupta. Thorace transverso, basi utrinque subsinuato, versus angulos anticos arcuatim angustato, convexo, disco subtilissime, minus dense, versus marginem anteriorem et latera paulo fortius et crebrius punctuata, summa basi punctis majoribus immixtis; stria marginali integra, interne striola, antice et postice abbreviata, margini laterali parallela, adjecta. Elytris lateribus parum rotundatis, apice solum versus angulum internum subtiliter, disperse punctulatis; striis dorsalibus paulo pone medium abbreviatis, prima ceteris brevior, 4-ta antice cum suturali confluenta, subhumerali interna abbreviata, cum humerali conjuncta, externa basi notata. Pygidio crebre, profunde, minus subtiliter punctato. Prosterno striis lateralibus antrorsum sensim approximatis. Tibiis anticis 4-5-denticulatis, dentibus tribus ultimis validis.

"Long. 3, lat. 2 mill.

"Ad urbem Taschkent." Turkestan.

XLVI.—*Some Remarks on Pteropus mascarinus*, *Mason*.

By KNUD ANDERSEN.

In the September number of this Journal (pp. 220-222) Mr. Geo. E. Mason gives a description of a supposed extinct species of fruit-bat, *Pteropus mascarinus*, from the small island La Ronde, about 15 miles north-east of Mauritius. The species is based on a single skull found in a fissure, in a superficial deposit of red earth, associated with bones of introduced animals, such as goat and rabbit.

A perusal of the description and measurements of the skull and teeth of *Pt. mascarinus* has satisfied me that the species must be exceedingly like the now living *Pt. rodricensis*, Dobson.

The skull of *Pt. mascarinus* is described as having a

"moderately long but heavy muzzle, flattened and scarcely concave frontal region; sagittal crest weakly developed, almost obsolete." In *Pt. rodricensis* the muzzle is moderately long but heavy; the sagittal crest in young adults undeveloped or almost obsolete, in aged individuals well developed but low; the frontal region (between postorbital processes) in young adults flattened and scarcely concave, in aged specimens distinctly concave. The type of *Pt. mascarinus* is no doubt a young or young adult specimen.

The canines in *Pt. mascarinus* are "long and sharp, both above and below, with unusually acute and prominent postero-internal basal ledges, those of the maxillary in particular"; the same is the case in *Pt. rodricensis*. p^2 in *Pt. mascarinus* is "very minute, but would have been still persistent in the type and standing in the tooth-row"; p^2 in *Pt. rodricensis* is minute and deciduous; the presence of the alveoli of this tooth in the type of *Pt. mascarinus* is additional evidence that it is a young or young adult individual.

It must be admitted that the above characters of the skull and teeth in *Pt. mascarinus* are rather vague; they are, in fact, common to a large number of species of *Pteropus*, and consequently do not give any conclusive evidence of the close affinity of *Pt. mascarinus* to *Pt. rodricensis*, far less of its possible identity with the latter species. But when we turn from the description to the measurements of the skull and teeth we are on much safer ground; nearly all the measurements of *Pt. mascarinus* show the most striking similarity to those of *Pt. rodricensis*. In the table below I compare the principal measurements of the skull and teeth of *Pt. mascarinus*, as given by Mr. Mason, with those of three skulls of adult specimens of *Pt. rodricensis* (one of them the type of the species) in the collection of the British Museum. It will be seen that the measurements of the two species are practically identical, with the following two exceptions, both of which are, most probably, apparent only, not real:—

- (1) The approximate basilar length of the skull of *Pt. mascarinus* is stated to be 44 mm., the approximate condylo-basal length 46 mm.; in *Pt. rodricensis* the measurements are respectively 46 and 51.7 mm.; the basilar length is practically the same in the two skulls (taking into consideration that the measurement of *mascarinus* is approximate only, and the type probably a young adult), whereas the condylo-basal length would seem to be widely different; but it must be said that, provided the basilar length in *mascarinus* is approximately 44 mm., the condylo-basal length cannot

possibly be 46 mm., but must be considerably greater; the latter measurement cannot have been taken by Mr. Mason in the usual way (from condylion to gnathion), or, if it has, it is wrong. (2) All the measurements of the teeth in the supposed two species are exceedingly alike, with one exception; in *Pt. rodricensis* m_1 is a trifle (0.1–0.2 mm.) shorter (antero-posterior extent) than p_4 , in *Pt. mascarinus* it would seem to be no less than 0.8 mm. longer than p_4 ; that m_1 , in a species of *Pteropus*, is considerably longer than p_4 , looks sufficiently strange to arouse doubt as to the correctness of the statement: but still more strange the character becomes from another point of view; in all species of *Pteropus* the width of m_1 is (very nearly) between two thirds and three fourths the length of the tooth, in *Pt. mascarinus* the width would be less than half the length of the tooth, and at the same time all other teeth, above and below, would be practically precisely similar to those of *Pt. rodricensis*! I have not much hesitation in saying that the width of m_1 is probably correctly given by Mr. Mason, but there must be some misprint or mistake in his measurement of its length.—If, now, I eliminate the two points discussed above, viz. the condylo-basal length and the length of m_1 in *Pt. mascarinus* (and I think I am justified in doing so), there remains a skull which, so far as Mr. Mason's description goes, agrees exactly with that of *Pt. rodricensis*.

In discussing the probable affinities of *Pt. mascarinus*, Mr. Mason comes to the conclusion that it "occupies a place intermediate between *Pteropus campyrus* [i. e. *Pt. Edwardsi*] and *Pt. rodricensis*, in size only, the dentition being typical of *Pteropus*, whereas the two above species fall into the subgenus *Spectrum*"; and "a great analogy, in fact, exists between the dentition of *Pt. mascarinus* and those species of *Pteropus* (*tonganus*, *Gouldii*, and *conspicillatus*) inhabiting Australia and the islands of the Pacific Ocean." A glance at the subjoined table of measurements is sufficient to show that *Pt. mascarinus* is not intermediate in size between *Pt. Edwardsi* and *Pt. rodricensis*, but similar to this latter species. Whether *mascarinus* is a distinct species or not cannot be decided with any degree of certainty, so long as its external characters are unknown; closely related species of *Pteropus* often agree in cranial and dental, and differ in external characters, and the distance between Mauritius and Rodriguez is great enough to make it possible that *mascarinus* is distinguishable from *rodricensis*. But so much is beyond all doubt, that in order to find "a great analogy" to *Pt. mas-*

carinus we need not go so far as Australia and Polynesia, but only the much shorter way from Mauritius to Rodriguez; it is with *Pt. rodricensis*, and this species only, that Mr. Mason ought to have compared the "Round Island" skull before he regarded it as representing a new species.

Mr. Mason calls *Pt. mascarinus* an *extinct* species. On what evidence? As already mentioned, the skull was found, superficially in a fissure, together with bones of introduced animals; the "state of preservation and general condition of the remains" show, Mr. Mason admits, that they are of quite recent origin. What, then, are the proofs that the skull is of an extinct species, rather than of an individual that died last year? Is the bat fauna of "Round Island" so well known that we can be sure that *Pt. mascarinus* does not exist there at this moment? In Mr. Mason's own words, only a "cursory" survey of the island was made by the party, "interested in the guano trade," who visited the island in 1906, and a member of which obtained the skull. Supposing, for the sake of argument only, that, for some reason or other, *Pt. mascarinus* has ceased to exist on the island, where are the proofs that it does not live in Mauritius, *which is situated only 15 miles from "Round Island"*? It is perfectly incredible that *Pt. mascarinus* should have been confined to the small "Round Island," which is not only situated in the closest proximity to the main island, Mauritius, but even *connected with this latter by several small islands!* The "possible cause for its [unproved] extinction" is supposed by Mr. Mason to be scarcity of food, "brought about by a series of dry or tempestuous seasons unduly prolonged." Is this mere speculation, or has Mr. Mason some proof that a series of dry "or" tempestuous seasons have occurred in La Ronde? Is it likely that all the individuals of a species of fruit-bat died for want of food when they had only to fly 15 miles to find abundance of food?—The plain facts are these: a person finds a bat skull lying superficially in a fissure; the skull is that of a species hitherto not recorded from the place where found or its nearest neighbourhood; the safest conclusion would seem to be: this person has come across the (actual or deserted) hiding-place of some fruit-bats, and this skull is unquestionable evidence that this very species, though hitherto not known from that place, must live there or in the neighbourhood; Mr. Mason's conclusion is: I am unable to refer this skull to any species recorded in literature from that place; consequently it is an extinct species.

The above remarks may be briefly epitomized as follows :—*Pt. mascarinus* is very closely related to, perhaps identical with, *Pt. rodricensis*; Mr. Mason was unaware of this fact, and therefore failed to point out any character by which it can be distinguished from *Pt. rodricensis*; and he has not given a particle of evidence that *Pt. mascarinus* is an *extinct* species.

*Measurements of Pteropus mascarinus * and rodricensis.*

| | <i>Pt. mascarinus.</i> | <i>Pt. rodricensis.</i> | | |
|----------------------------------|------------------------|------------------------------|----------------------|----------------------|
| | Type (after Mason). | Type. ♂ ad. 76.3.11.1. | ♂ ad. 76.3.15.14. | ♀ ad. 76.3.15.15. |
| | mm. | mm. | mm. | mm. |
| Skull: upper length | (49) | .... | 52.2 | .... |
| " condylo-basal length | (46) | .... | 51.7 | .... |
| " basilar length | (44) | .... | 46 | .... |
| " zygomatic width | (27) | 30.8 | .... | 28.2 |
| " across m^2 - m^2 ext. | 13 | 12.8 | 13.3 | 13 |
| " across p^1 - p^1 ext. | 13.8 | 13.6 | 14 | 13.1 |
| " interorbital width .. | 7.8 | 7.5 | .... | 8.8 |
| Mandible | 40.6 | 41.2 | 41.2 | 39.2 |
| Upper teeth, c - m^2 | 20.1 | 19.8 | 19 | 18.5 |
| Lower teeth, c - m_3 | 22.3 | 22 | 22 | 20.7 |
| p^3 , length | 3.8 | 3.7 | 3.8 | 3.7 |
| " width | 2.3 | 2.7 | 2.6 | 2.6 |
| p^4 , length | 3.8 | 3.8 | 3.9 | 3.7 |
| " width | 3 | 2.8 | 2.8 | 2.7 |
| m^1 , length | 4.1 | 4.1 | 4.1 | 3.9 |
| " width | 2.1 | 2.1 | 2.5 | 2.2 |
| m^2 , length ..... | .... | 2 | 2 | 2 |
| " width ..... | .... | 1.7 | 1.6 | 1.7 |
| p_{23} , length | 2 | 2 | 2 | 1.8 |
| " width ..... | .... | 1.8 | 1.8 | 1.6 |
| p_{33} , length | 3.8 | 4.1 | 4.1 | 3.9 |
| " width | 2.1 | 2.2 | 2.2 | 2.2 |
| p_{43} , length | 3.5 | 3.9 | 4.1 | 3.8 |
| " width ..... | .... | 2.3 | 2.5 | 2.3 |
| m_{11} , length | 4.3 | 3.7 | 3.9 | 3.7 |
| " width | 2 | 2.1 | 2.2 | 2.1 |
| m_{22} , length | 3 | 2.8 | 2.9 | 3 |
| " width | 1.8 | 2 | 2 | 2 |
| m_{33} , length | 1.5 | 1.5 | 1.7 | 1.4 |
| " width | 1.4 | 1.2 | 1.3 | 1.2 |

* The measurements in parentheses of *Pt. mascarinus* are approximate.

XLVII.—*Notes on the Crustacea of the Channel Islands.* By
Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S.,
F.L.S.

[Plates XVI. & XVII.]

THE following publications relate to those Crustacea which are already recorded from the Channel Islands :—

1. 'The Channel Islands.' By D. T. ANSTED and R. G. LATHAM. 1862, pp. 231-235. In this work the list of Cirripedia was supplied by Mr. Collings, that of the Stalk-eyed Crustacea by Mr. Lukis and Mr. Le Lievre, that of the Isopoda and Amphipoda by Mr. Le Lievre, and that of the Entomostraca by Mr. Collings.
2. 'Recherches sur la Faune Marine des Iles Anglo-Normandes.' By Dr. RENÉ KÖHLER. 1885.
3. WALKER (A. O.) and HORNELL (J.). "Report on the Schizopoda, Cumacea, Isopoda, and Amphipoda of the Channel Islands," Journ. Marine Zoology and Microscopy, vol. ii. 1896, pp. 49-55.
4. THOMPSON (ISAAC C.). "Report on the Plankton Copepoda of the Channel Isles," Journ. Marine Zoology and Microscopy, Dec. 1897. I have not seen this paper, but, according to Mr. Sinel, it contains thirty-one species.
5. SINEL (JOSEPH). "A Contribution to our Knowledge of the Crustacea of the Channel Islands," Trans. Guernsey Soc. of Nat. Sci. 1906.

M. Chevreux collected at Jersey, and sent a list of species to Messrs. Walker and Hornell for use in their Catalogue.

THE STALK-EYED CRUSTACEA (EXCEPT SCHIZOPODA).

The following is a full list of the Stalk-eyed Crustacea which have been recorded. I have found almost all the species myself, but they are here given on the authority of (A.) Ansted, (K.) Köhler, (S.) Sinel. Where no letter follows a name all three writers include the species; where an initial letter or letters follow the name it must be understood that the writer or writers thus indicated record the species.

After the list I add some notes on a few species.

Many of the Stalk-eyed Crustacea which are found in the Channel Islands have been figured by Mr. J. Sinel in his recently published 'An Outline of the Natural History of our Shores,' 1906 (Swan, Sonnenschein, & Co.). This is a very useful work for any person commencing the study of marine zoology.

Ebalia tuberosa, Pennant.
 — *tumefacta*, Montagu.
 — *Cranchii*, Leach.
Corystes cassivelaunus, Montagu.
Ateleyclus septemdentatus, Montagu. A., S.
Thia polita, Leach.
Polybius Henslowii, Leach. A., S.
Portunus latipes, Pennant. K., S.
Portunus puber, Linné.
 — *corrugatus*, Pennant.
 — *depurator*, Linné. K., S.
 — *marmoreus*, Leach. K., S.
 — *holsatus*, Fabricius.
 — *pusillus*, Leach.
 — *arcuatus*, Leach.
Bathynectes longipes, Risso. S.
Carcinus mœnas, Linné.
Perimela denticulata, Montagu.
Pilumnus hirtellus, Linné.
Xantho floridus, Montagu.
 — *hydrophilus*, Herbst.
Cancer pagurus, Linné.
Gonoplax angulatus, Pennant. S.
Nautilograpsus minutus, Linné. A.
Pinnotheres pisum, Pennant.
Eurynome aspera, Pennant.
Mamaia squinado, Herbst.
Pisa tetradon, Pennant.
 — *biaculeata*, Montagu.
Hyas coarctatus, Leach.
 — *araneus*, Linné. K.
Inachus dorsetensis, Pennant.
 — *dorynchus*, Leach.
 — *leptochirus*, Leach. K., S.
Achæus Cranchii, Leach. K., S.
Macropodia rostrata, Linné.
 — *longirostris*, Fabricius.
 — *ægyptia*, H. M.-Edwards. K., S.
Dromia vulgaris, H. M.-Edwards.

Anapagurus Hyndmanni, W. Thompson. K., S.
Pagurus bernhardus, Linné.
 — *Prideauxii*, Leach.
 — *cuanensis*, W. Thompson. K., S.
Galathea strigosa, Linné.
 — *squamifera*, Montagu.
 — *nexa*, Embleton. K.?, S.
 — *intermedia*, Lilljeborg. S.
Porcellana platycheles, Pennant.
 — *longicornis*, Pennant.
Callianassa subterranea, Montagu.
Upogebia stellata, Montagu.
Axius stirynchus, Leach.
Arctus ursus, Dana.
Palinurus vulgaris, Latreille.
Homarus gammarus, Linné.
Crangon vulgaris, Linné.
Pontophilus spinosus, Leach. S.
Ægeon (?) *trispinosus*, Hailstone. S.
 — *fasciatus*, Risso. K., S.
 — *sculptus*, Bell. A., S.
Nika edulis, Risso. K., S.
Lysmata seticaudata, Risso. S.
Alpheus macrocheles, Hailstone. K., S.
Athanas nitescens, Montagu.
Hippolyte varians, Leach. K., S.
 — —, var. *fascigera*, Gosse. S.
 — *Prideauxiana*, Leach. S.
Spirontocaris Cranchii, Leach. K., S.
Pandalus annulicornis, Leach. K., S.
Pandalina brevisrostris, Rathke. S.
Anchistia scripta, Heller. S.
Palaemon serratus, Pennant.
 — *squilla*, Leach. K., S.
Palaemonetes varians, Leach. A., S.
Squilla Desmarestii, Risso.

Anapagurus levis, W. Thompson. I dredged several specimens of this species near St. Peter's Port Harbour, Guernsey, last summer (1906), and *A. Hyndmanni* and *P. cuanensis* in the same neighbourhood.

Galathea dispersa, Bate.

— *intermedia*, Lilljeborg.

Both these species occur off Guernsey, but I have not seen *G. nexa* from the Channel Isles. It is possible that the species which has been recorded as *G. nexa* was really *G. dispersa*.

Lyasmata seticaudata, Risso.

1816. *Meliceria seticaudata*, Risso, Hist. nat. Crustacés de Nice, p. 110, pl. ii. fig. 1.
 1826. *Lyasmata seticaudata*, Risso, Hist. nat. de l'Europe mérid. vol. v. p. 62.
 1828. *Lyasmata seticaudata*, Roux, Crust. de la Médit. pl. xxxvii.
 1837. *Lyasmata seticaudata*, H. Milne-Edwards, Hist. nat. des Crust. vol. ii. p. 386, pl. xxv. fig. 10; Atlas Règ. Anim. de Cuvier, pl. liv. fig. 3.
 1863. *Lyasmata seticaudata*, Heller, Crust. des südlichen Europa, p. 234, pl. viii. fig. 1.
 1906. *Lyasmata seticaudata*, Sinel (J.), An Outline of the Natural History of our Shores, p. 134.

Antennules with three flagella. Rostrum with six teeth above, of which two or three are on the carapace and two below. First feet didactyle, tolerably strong. Second feet of both sides greatly lengthened and having the carpus divided into very numerous jointlets. Telson with two pairs of dorsal spines. Outer uropod two-jointed. The colouring is peculiarly characteristic, being brilliant red, with four pale or white lines extending longitudinally along the entire length of the animal.

About the year 1889 Mr. J. Sinel procured a specimen of this beautiful Mediterranean prawn in a lobster-pot at La Rocque, Jersey. He wrote to ask me what it was, introducing into his letter a pencil sketch. That sketch undoubtedly represented *Lyasmata seticaudata*, a most interesting addition to the fauna. Unfortunately the present existence of this specimen is unknown. Mr. Sinel tells me that he parted with it to some collector, but he cannot recall to mind who was the recipient. Perhaps this note may bring to light the possessor of this unique British specimen.

Spirontocaris pusiola, Kröyer. I have a Jersey specimen sent to me by Mr. Sinel many years ago.

Anchistia scripta, Risso.

1816. *Alpheus scriptus*, Risso, Hist. nat. de l'Europe mérid. vol. v. p. 78.
 (?) *Periclemenes elegans*, Costa, Fauna del Regno di Napoli, pl. vi. figs. 1-6.
 1849. *Palæmon bilinguiculatus*, Lucas, Anim. Artic. de l'Algérie, p. 45, pl. iv. fig. 4.
 1861. *Dennisia sagittifera*, Norman, Ann. & Mag. Nat. Hist. ser. 3, vol. viii. p. 8 (separate copy), pl. xiii. figs. 8-13.
 1863. *Anchistia scripta*, Heller, Crust. des südlichen Europa, p. 256, pl. viii. figs. 18, 19.

I dredged the specimen described by me in 1861 in St. Catherine's Bay, Jersey, among *Zostera* in 1859. Mr. Sinel took a second example in St. Clement's Bay, Jersey, in 1890, and Mr. Frank Wright captured a third near St. Peter's Port, Guernsey, in 1905.

SCHIZOPODA.

In the lists which follow, initials affixed to a locality make known the naturalist on whose authority it is inserted. Thus:—

II. Hornell (James).
N. Norman (A. M.).
S. Sinel (Joseph).
S. & II. Sinell and Hornell.
W. Walker (A. O.).
W. & II. Walker and Hornell.

In cases where no initial follows the locality or localities it will be understood that they are on my own authority.

Nyctiphanes Couchii, Bell. Jersey (*Sinel*, fide *Kochler*).

Siriella jaltensis, Czerniavsky. Guernsey and Jersey.

— *Clausii*, G. O. Sars. Guernsey.

— *armata*, H. M.-Edwards. Jersey.

Gastrosaccus sanctus, P. J. van Beneden. Jersey.

— *spinifer*, Goës. Jersey (*Museum at Bootle, Lancashire*, fide *W.*).

Anchialina agilis, G. O. Sars. Off Alderney, tow-net (*Dr. Gough in Mus. Nor.*); Guernsey (*W.*).

For the genus *Anchialina*, see Norman and Scott, 'Crustacea of Devon and Cornwall,' 1906, p. 24.

Heteromysis formosa, S. I. Smith. Guernsey.

Mysidopsis gibbosa, G. O. Sars. Guernsey (*A. O. Walker, in litt.*, Sept. 4, 1892).

Leptomysis mediterranea, G. O. Sars. Guernsey and Jersey.

Mesopodopsis Slabberi, P. J. van Beneden. Jersey (*Museum at Bootle, Lancashire*, fide *W.*).

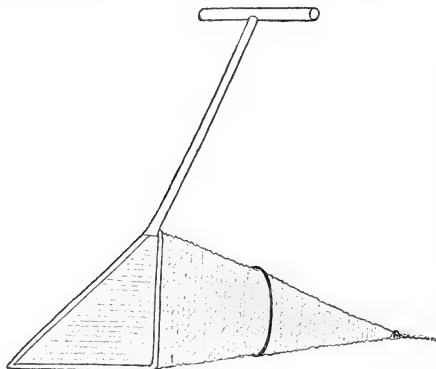
Macromysis flexuosa, Müller. Abundant.

Mr. Sinel, whom I had the pleasure of seeing at Jersey last year (1906), told me that species of *Mysidea* were caught at Jersey and made into a paste called "Chervé," used in fishing. He subsequently, in answer to my enquiries, sent me the following account of this preparation:—

"At present the fishers of 'Chervé' have to obtain a licence from the chief fishery inspector to enable them to carry on this very old practice—a very absurd law. They take it both day and night during the spring tides in the large gravelly pools, among the *Zostera*, in the southern bays.

"It is taken in large hand-nets, with usually a cross-bar

to the handle, so that the fisher's breast bears on it [see figure]. The nets are from 3 feet to 4 feet 6 inches across the wooden (ash) blade which forms the base. The best



nets are of horsehair cloth, as used for sieves, but ordinary linen cheese-cloth is mostly used. At about 18 inches from the pocket of the net a cane ring with netting of about three quarters of an inch mesh is inserted across it, so as to prevent the entrance of larger objects (crabs, shrimps, &c.) among the Mysids.

"The men usually wade waist-deep, pushing the net before them for ten minutes or so, when they untie the pocket end and empty their catch into their basket.

"When the 'Chervé' is brought home it is mixed with a sufficient quantity of coarse salt to preserve it, and then it is pressed into pans. It forms a pink-coloured compost. This is sold to mullet-anglers at about four shillings a gallon, though many anglers obtain a licence and take their own supply.

"The favourite places for mullet are not far from the shore, and high water is the best time for the sport. The angler takes a spoonful of 'Chervé' from his tin, uses it as a ground-bait, and waits awhile. If no mullet turn up in ten or twenty minutes, he tries another spot or goes home; but almost invariably a few are soon attracted, to be followed by a crowd. The 'Chervé' tints the water pinkish for some yards around, and has a strong and not pleasant smell, like that of boiled prawn or lobster gone bad.

"I am constantly consulted respecting some substitute for 'Chervé': crabs and shrimps pounded in a mortar and salted; ray-fish boiled with sugar; bread soaked in shrimp soup; cabbage boiled in fat, &c., &c.; but 'Chervé' still holds its own. I have often been astonished when sitting on a jetty fishing for *Labrus* &c., and not a mullet in sight for hours; then down comes a 'mulleter,' who throws in a spoonful of 'Chervé,' and in a minute one or two dark forms come into the field, then more and more, and their silvery sides flash as they turn about and suck up the 'Chervé.'"

Mr. Sinel kindly sent me a bottle of "Chervé" as taken from the net. Small pieces of seaweed were mixed with the animals. Both in numbers and in bulk *Macromysis flexuosa* predominated, but *Schistomysis spiritus* was present in large numbers, together with a few *Siriella armata*. No doubt the admixture of species would vary in different spots and in different seasons. That the *Mysidea* were used as bait was quite a new fact to me, as it probably will be to other carcinologists.

Macromysis neglecta, G. O. Sars. Guernsey and Jersey.

— *inermis*, Rathke. Guernsey.

Schistomysis spiritus, Norman. Guernsey and Jersey.

— *ornata*, G. O. Sars. Off St. Sampson's Harbour, Guernsey.

— *Helleri*, G. O. Sars. Guernsey and Jersey.

Neomysis vulgaris, J. V. Thompson. Arnold's Pond, Guernsey, 1865.

SYMPODA (=CUMACEA).

Iphinoë trispinosa, Goodsir. Off St. Sampson's, Guernsey (N.); Jersey (W. & H.).

— *serrata*, Norman. Guernsey.

Cumopsis Goodsiri, P. J. van Beneden. Abundant from washing sand dug at low-water spring tides in Belgrave Bay, Guernsey.

Eudorella truncatula, Bate. Dredged Guernsey, 1865.

Diastylis levis, Norman. Dredged near St. Martin's Point, Guernsey.

Pseudocuma similis, G. O. Sars. Shallow water, sand, Guernsey.

— *longicornis*, Bate. Jersey (W. & H.).

Cumella pygmaea, G. O. Sars. Guernsey.

Nannastacus unguiculatus, Bate. Guernsey (W.); Jersey (N.).

ISOPODA.

Apscudes Latreillii, Milne-Edwards. Very abundant off Guernsey (A. M. N.); Jersey (W. & H.). Bate and Westwood state
Ann. & Mag. N. Hist. Ser. 7. Vol. xx. 24

that I had taken *A. talpa* off Guernsey, but the species I sent them was *A. Latreillii*.

Apseudes talpa, Leach. Jersey (Köhler).

Tanais Cavolinii, Milne-Edwards. Guernsey and Jersey (S. & H.).

Leptochelia Savignii, Kröyer. Guernsey (N.); Herm (Köhler); Jersey (S. & H.).

Tanaissus Lilljeborgii, Stebbing. In sand, low water, Belgrave Bay, Guernsey.

Paratanais Batei, G. O. Sars. Jersey (S. & H.); Sark (Köhler), as *Paratanais forcipatus*.

Anthura gracilis, Montagu. Jersey (S. & H.).

Paranthura nigropunctata, Lucas. Guernsey, 1865 (N.); Jersey (S. & H.).

Gnathia maxillaris, Montagu. Guernsey (N.); Jersey (S. & H.).

Anilocra physodes, Linné (= *A. mediterranea*, Leach). Herm, 1865 (N.); Jersey (S. & H.); Guernsey (F. Wright).

Æga rosacea, Risso, = *Æga bicarinata*, Leach, and Bate and Westwood. A specimen of this species was brought to me by a trawler last year at Guernsey. In 1894 (Ann. & Mag. Nat. Hist. ser. 7, vol. xiv. p. 433), and again last year in Norman and Scott ('The Crustacea of Devon and Cornwall,' p. 38), I questioned whether *Æga rosacea* could with certainty be regarded as a British species; but I had overlooked the fact that Sinel and Hornell had recorded the occurrence (in Walker & Hornell's paper) of two specimens taken at Jersey on the fish *Squatina angelus*.

Cirrolana Cranehii, Leach. Off St. Sampson's Harbour, Guernsey (N.); Jersey (Köhler).

— *borealis*, Lilljeborg. Guernsey, 1865, rare.

Conilera cylindracea, Montagu. Guernsey and Jersey.

Eurydice spinigera, H. J. Hansen. Jersey (Sinel, in Mus. Nor.).

Limnoria lignorum, Rathke. Jersey (S. & H.).

Sphaeroma serratum, Fabricius. Herm (N.); Jersey (S. & H.).

— *Hookeri*, Leach. Guernsey, Cobo Bay &c., 1865.

Cymodice truncata, Montagu. Guernsey and Jersey.

Nesa bidentata, Leach. Guernsey, Herm, Jersey.

Campeopea hirsuta, Montagu. Guernsey (N.); Jersey (W. & H.).

Idotea balthica, Pallas. Common.

— *neglecta*, G. O. Sars. Guernsey, Jersey.

— *emarginata*, Fabricius. Jersey, tow-net (Köhler).

— *linearis*, Linné. Guernsey, very large (N.); Jersey (S. & H.).

— *salinarum*, Dollfus (= ? *viridis*, Slabber). Arnold's Pond, Guernsey, 1865.

Zenobiana prismatica, Risso. Jersey (Sinel, in Mus. Nor.).

- Stenosoma acuminatum*, Leach. A single specimen, St. Aubin's, Jersey (Kæhler).
 — *lanciferum*, Leach. Jersey. In Walker & Hornell's list, but no habitat is given.
Astacilla longicornis, Sowerby. Guernsey, 1865.
Asellus aquaticus, Linné. Guernsey.
Janira maculosa, Leach. Jersey (S. & H.).
Jæra Nordmanni, Rathke. Jersey (S. & H.); Sark (Kæhler).
 — *marina*, Fabricius. Guernsey, Jersey.
Jeropsis brevicornis, Kæhler. The types, Gouliot Caves, Sark (Kæhler, who kindly gave me a specimen).
Munna Krøyeri, Goodsir. Jersey (S. & H.).
 — *limicola*, G. O. Sars. Dredged, Guernsey.
Ligia oceanica, Linné. Guernsey and Jersey.
Oniscus asellus, Linné. Abundant.
Porcellio scaber, Latreille. Common.
Platyarthrus Hoffmannseggii, Brandt. St. Sampson's, Guernsey.
Armadillidium vulgare, Latreille. Abundant.
Bopyrus squillarum, Latreille. Guernsey and Jersey.
Bopyrina Giardi, Bonnier. Many on *Hippolyte varians*, Jersey, 1859.
Bopyroides hippolytes, Krøyer. "Parasitic on *Hippolyte*" (S. & H.).
Pleurocrypta galathee, Hesse. In *Galathea squamifera*, Guernsey (N.); Jersey (Kæhler).
 — *strigosa*, Giard & Bonnier. In *Galathea strigosa*.
 — *intermedia*, Giard & Bonnier. In *Galathea intermedia*, Guernsey.
Athelges paguri, Rathke. On *Pagurus bernhardus*, Guernsey, 1865 (N.); Jersey (Kæhler).
Gyge branchialis, Cornalia & Pancer. In *Upogebia stellata*, Jersey, 1859.
Ione thoracica, Montagu. In *Callianassa subterranea*, Jersey (S. & H.).
Liriopsis pygmaea, Rathke. Guernsey, 1865.

AMPHIPODA.

- Hyperia galba*, Montagu (S. & H.).
Talitrus locusta, Pallas. Common.
Orchestia gammarellus, Pallas. Guernsey (N.); Jersey (Kæhler).
 — *mediterranea*, Costa. Jersey (Chevreux, W.).
Hyale Nilssoni, Rathke. Jersey (Chevreux, W.).
 — *Lubbockiana*, Bate. Jersey (Kæhler, S.).

Lysianassa plumosa, Boeck, = *L. Costæ*, B. & W. (nec Milne-Edw.).
Guernsey and Jersey.

— *ceratina*, Walker, = ? *longicornis*, Lucas. Guernsey and Jersey.

Acidostoma obesum, Bate. Jersey (S.).

Socarnes erythrophthalmus, D. Robertson. Guernsey.

Perierella Audouiniana, Bate. Jersey (*Chevreux*, S.).

Tryphosites longipes, Bate. Guernsey (N.); Jersey (S.).

Hippomedon denticulatus, Bate. Jersey (S.).

Haplonyx cicada, Fabricius, = *A. Höllbolli*, B. & W. Jersey (S. & H.).

Callisoma Hopei, Costa, = *C. crenata*, Bate. Jersey (S.).

Orchomene humilis, A. Costa, = *O. Batei*, G. O. Sars. Jersey.

Tryphosella Sarsi, Bonnier. Jersey (W. & H.).

Nannonyx Goesi. Grand Azette, Jersey, spring tide (W. & H.).

Menigrates obtusifrons, Boeck. Jersey (S. & H.).

Lepidepecreum longicorne, Bate. Guernsey (N., W.); Jersey (S. & H.).

Bathyporeia Guilliansonia, Bate, = *B. norvegica*, G. O. Sars.
Guernsey (N.); Jersey (S. & H.).

— *pelagica*, Bate. In sand, low water, Belgrave Bay, Guernsey (N.), Jersey (S. & H.).

— *Robertsoni*, Bate. Jersey (S.).

Haustorius arenarius, Slabber. Jersey (S.).

Urothoe marinus, Bate. Jersey (*Chevreux*, S.).

— *brevicornis*, Bate. Guernsey (W.); Jersey (S. & H.).

— *elegans*, Bate. Jersey (S. & H.).

— *pulchella*, Costa. Jersey (*Chevreux*).

Metaphoxus simplex, Bate. Guernsey (N.).

— *Fultoni*, T. Scott. Jersey (*Chevreux*); off Noirmont Point (S. & H.).

Harpinia neglecta, G. O. Sars, = *Phoxus plumosus*, Bate. Jersey (S.).

— *pectinata*, G. O. Sars. Dredged off Belgrave Bay, Guernsey, several specimens. It was not a species which I could have expected to find in the Channel Islands.

Ampelesea typica, Bate. Guernsey (N.); Jersey (S. & H.).

— *tenuicornis*, Lilljeborg. Guernsey (N.); Jersey (*Chevreux*).

— *assimilis*, Boeck. Off St. Martin's Point, Guernsey.

— *spinipes*, Boeck. Guernsey.

— *brevicornis*, Costa, = *A. Belliana*, B. & W. Guernsey (N.); Jersey (S. & H.).

— *gibba*, G. O. Sars. Off St. Peter's Port, Guernsey, in 7 fath., 1892 (W.).

Amphilochus manudens, Bate. Jersey (S. & H.).

Amphilocheus neapolitanus, Della Valle, = *A. melanops*, Walker.
Bordeaux Harbour, Guernsey; and Jersey.

Peltocoxa Marioni, Catta, = *Cyproidea damnoniensis*, Stebbing.
Jersey.

Stenothoe monoculoides, Montagu. Guernsey and Jersey.

—— *marina*, Bate. Jersey (Kæhler).

Metopa rubrovittata, G. O. Sars. Bordeaux Harbour, Guernsey.

—— *borealis*, G. O. Sars. Off St. Martin's Point, 25 fath. (W.).

Metopa sarniensis, sp. n. (Pl. XVII. figs. 1-5.)

A very small species. The antennules and antennæ are subequal in length, and the peduncles of both are quite smooth and devoid of setæ. The first joint of peduncle of the antennules is stout and equals in length the two following joints; the flagellum is 8-jointed, the first of these joints equals in length the last two joints of the peduncle. The first gnathopod (fig. 1) is remarkable on account of the very short carpus, which is somewhat triangular; the propodos equals nearly three times the length of the carpus, it gradually tapers for the attachment of the gently curved finger; the propodos has one seta on the side near the end and a bundle of three below the attachment of the finger; the finger (fig. 2) has its distal portion minutely denticulated or serrated; two minute setæ are on its side above the serrations, and there are no others.

The second gnathopod (fig. 3) is subchelate and resembles that of many members of the genus in its general form. The hand widens gradually and slightly from its base, and distally is abruptly truncated, so that the palm is transverse (fig. 4); the nail is strong and about equals the transverse palm in length; it has on its back four setæ, and on the palm where the tip of the finger meets it there is a group of slender spines and a few setæ.

The last peræopods (fig. 5) have the basos outspread behind into a thin lamina, which is devoid of setæ or spines; the meros is expanded behind and projects down to near the extremity of the carpus.

The first gnathopods are, perhaps, more valuable in this genus for specific characters than the second, though the latter are so much the larger. In this species the first gnathopod is quite different from that of any other species of the genus known to me; both the very short carpus and the serrated tip of the finger are quite exceptional.

A single specimen was dredged, July 1906, not far from the harbour of St. Peter's Port, Guernsey.

- Leucothoe spinicarpa*, Abildgaard. Guernsey (W.); Jersey (S. & H.).
- *Lilljeborgii*, Boeck. Guernsey.
- “*furina*, Savigny.” Jersey (Sinel). Perhaps the same as the last.
- Percionotus testudo*, Montagu. Jersey (S.).
- Lapllystius sturionis*, Kröyer, = *Darwinia compressa*, Bate. Jersey (S. & H.).
- Colomastix pusilla*, Grube. Jersey (*Chevreaux*); Sark (*Kœhler*).
- Odius carinatus*, Bate. Jersey (S.).
- Epimeria cornigera*, Fabricius, = *Acanthonotus Oweni*, B. & W. Jersey (S.).
- Iphimedia obesa*, H. Rathke. Guernsey (W.); Jersey (S.).
- *minuta*, G. O. Sars. Guernsey.
- *Eblance*, Bate. “Not common, Vermarette, Herm” (S.). Perhaps the preceding species, which the author did not know.
- Lilljeborgia pallida*, Bate. Jersey (S.).
- *picta*, Norman. The type specimens were taken by me off Guernsey in 1865.
- Monoculodes carinatus*, Bate. Off St. Sampson’s Harbour, Guernsey (N.); Jersey (W. & H.).
- Periculodes longimanus*, Bate & Westwood. Guernsey and Jersey.
- Pontocrates arenarius*, Bate. “St. Clement’s Bay, Jersey, not common” (S.). Perhaps not this, but the next species.
- *norvegicus*, Boeck. Guernsey (N.); Jersey (*Chevreaux*).
- Synchelidium haplocheles*, Grube. Guernsey (N.); Jersey (W. & H.).
- Calliopius leviusculus*, Kröyer, = *C. Rathkei*, Zaddach. Guernsey (N.); Jersey (W. & H., S.).
- Apherusa cirrus*, Bate, = *A. borealis*, G. O. Sars. Guernsey and Jersey.
- *ovalipes*, Norman & Scott.
1906. *Apherusa ovalipes*, Norman & Scott, Crustacea of Devon and Cornwall, p. 75, pl. viii. figs. 1-8.
- Fermain Bay, Guernsey.
- *bispinosa*, Bate. Guernsey (N.); Jersey (W. & H., S.).
- *Jurinei*, H. M.-Edwards. Tide-marks, Belgrave Bay, Guernsey (N.); Jersey (W. & H.).
- Sympleustes latipes*, M. Sars. Jersey (S.).
- Nototropis Swammerdamii*, H. M.-Edwards. Jersey (N.).
- *vedlomensis*, Bate. Fermain Bay, Guernsey (N.); Jersey (W. & H., S.).
- Dexamine spinosa*, Montagu. Guernsey and Jersey.
- *thea*, Boeck. Guernsey and Jersey.
- Tritacta gibbosa*, Bate. Jersey (W. & H., S.).

Guerneæ coalita, Norman. Bordeaux Harbour, Guernsey; and Jersey.

Eusirus longipes, Boeck. Shore near St. Helier's, Jersey (W. & H.).

Amathilla Homeri, Fabricius. Jersey (S. & H.).

Isæa Montagui, H. M.-Edwards. On *Mamaia squinado*, Guernsey (N.); Jersey (S. & H.).

Niphargus fontanus, Bate. Sinel records this from four covered-in wells in Jersey.

— *subterraneus*, Leach, = *N. aquilex*, B. & W. Mr. Frank Wright, of the Library, St. Peter's Port, has recently sent me a specimen of this species taken in a well at Guernsey.

Cheirocratus Sundevalli, H. Rathke. Fermain Bay, Guernsey (N.); Jersey (Chevreux).

— *assimilis*, Lilljeborg. Near St. Martin's Point, Guernsey.

Gammarella brevicaudata, H. M.-Edwards. Guernsey (N.); Jersey (W. & H., S.).

Gammarus locusta, Linné. Common.

— *pulex*, De Geer. Common.

— *marinus*, Leach. Guernsey and Jersey (W. & H., S.).

— *campylops*, Leach. Jersey (Chevreux, W. & H., S.).

Echinogammarus Berilloni (Catta). (Pl. XVI. figs. 1, 2.)

1878. *Gammarus Berilloni*, Catta, "Note sur le *Gammarus Berilloni*, n. sp.," Bull. Soc. Borda Dax. 1^{er} trimestre, p. 1, pl. i. figs. 1, 2.

1896. *Gammarus Berilloni*, Chevreux, Bull. Soc. Zool. France, vol. xxi. p. 24, and woodcuts.

1906. *Echinogammarus Berilloni*, Stebbing, Das Tierreich, Amphipoda, I. Gammaridea, p. 481.

I am indebted to M. Chevreux for one of the examples of this interesting species which he procured in Jersey. It is at once distinguished from our previously known British allies by the dense clothing of spines and setæ on the metasome. It was found by Catta at Mondarran (Basses-Pyrénées), and has subsequently been met with again, but only in the same district, namely at St. Jean de Lux and near Biarritz, and I have received from Don Ignacio Bolivar, of the Madrid Museum, specimens which came from San Sebastian. It is remarkable that this freshwater species should have been met with at such a place as Jersey.

Melita palmata, Montagu. Guernsey (N.); Jersey (W. & H., S.).

— *obtusata*, Montagu. Guernsey (N.); Jersey (W. & H., S.).

— *gladiosa*, Bate. Guernsey (N.); Jersey (S.).

Mæra grossimana, Montagu. Guernsey, Herm, Jersey.

— *othonis*, H. M.-Edwards. Guernsey.

— *Batei*, Norman. I dredged the type specimens off St. Martin's Point, Guernsey, in 1865.

Ceradocus semiserratus, Bate. Guernsey, off St. Martin's Point.

Megaluropus agilis, Norman. Guernsey, in tow-net.

Microdeutopus darmoniensis, Bate. Guernsey and Jersey (W.).

— *gryllotalpa*, Costa. (Pl. XVI. fig. 3; Pl. XVII. figs. 6, 7.)

1893. *Microdeutopus gryllotalpa*, Della Valle, Faun. und Flor. des Golfes von Neapel, Gammarini, p. 44, pl. i. fig. 12, pl. xi. figs. 25-43.

1894. *Microdeutopus gryllotalpa*, G. O. Sars, Crust. Norway, Amphipoda, p. 543, pl. excii. fig. 2.

1906. *Microdeutopus gryllotalpa*, Stebbing, Das Tierreich, Amphipoda, I. Gammaridea, p. 590.

Found at Jersey by M. Chevreux and Mr. Sinel.

I have given figures of the one-jointed accessory flagellum of the antennules (Pl. XVII. fig. 6), which is shorter than the first joint of the flagellum, and of the first gnathopod of the male, for comparison with the same parts in the following species. This gnathopod has 2-4 toothed processes on the hinder margin of the carpus, which increase in size distally. Della Valle gives only two such processes. I figure (Pl. XVII. fig. 7) a gnathopod with three such processes from Plymouth (as figured by Sars and by Bruzelius, *Autonoe grandimana*), and (Pl. XVI. fig. 3) another carpus from Valencia, Spain, with four processes (as figured by Costa).

— *stationis*, Della Valle. (Pl. XVI. fig. 4; Pl. XVII. figs. 8-11.)

1888. *Microdeutopus gryllotalpa*, Nebeski, Beit. zur kennt. der Amphip. der Adria, p. 45, pl. iv. fig. 41.

1893. *Microdeutopus stationis*, Della Valle, Faun. u. Flor. des Golfes von Neapel, Gammarini, p. 415, pl. v. fig. 9, pl. x. figs. 31-41.

1906. *Microdeutopus stationis*, Stebbing, Das Tierreich, Amphipoda, I. Gammaridea, p. 590.

Sowinsky has referred a *Microdeutopus* found in the Black Sea to this species; but I cannot reconcile the fig. 6 in his paper of 1891 with the first gnathopod (male) of this species. Nebeski gives an interesting series of figures illustrative of the gradual change in form of the gnathopod from the young to the adult.

I last year dredged many specimens of this addition to our fauna off St. Peter's Port, Guernsey.

I have figured some of the most salient features which distinguish this species from *M. gryllotalpa*. The secondary appendage of the antennules is 3-4-jointed and is equal in length to the first three joints of the flagellum (Pl. XVII. fig. 8). The first gnathopod in the male has not quite so massive a carpus as in that species (Pl. XVII. figs. 9 & 10). The carpus is armed with three teeth at the extremity (not passing down the hind margin); these teeth are not in the same straight line, the innermost and bluntest tooth bends away from the large central tooth, so that it would appear that the finger closes down between them. Pl. XVII. fig. 11 represents the distal portion of the first gnathopod of the female, and Pl. XVI. fig. 4 the second gnathopod of the male.

Stimpsonella chelifera, Bate. Guernsey (N.); Jersey (S. & H.).

Coremapus versiculatus, Bate.

1906. *Coremapus versiculatus*, Norman & Scott, Crustacea of Devon and Cornwall, p. 85, pl. ix. figs. 8-10.

Guernsey, common (N.); Jersey (*Chevreaux*).

Lembos Websteri, Bate. Sark (*Kæhler*).

Aora typica, Krøyer, = *A. gracilis*, Bate.

Stebbing has synonymized these two names, and I think that he is right. I have taken *Aora* occasionally off Guernsey.

Leptocheirus pectinatus, Norman.

1906. *Leptocheirus pectinatus*, Norman & Scott, Crustacea of Devon and Cornwall, p. 87, pl. ix. figs. 1-3.

Off St. Sampson's, Guernsey (N.); Jersey (*Chevreaux*).

Leptocheirus guttatus, Grube.

1887. *Ptilocheirus tricristatus*, Chevreux, "Crust. Amphip. de la côte ouest de Bretagne," Bull. Soc. Zool. France, vol. xiii. p. 23, pl. v. figs. 3, 4, and woodcut at p. 6.

1906. *Leptocheirus guttatus*, Norman & Scott, Crustacea of Devon and Cornwall, p. 85, pl. ix. figs. 4-7.

Off St. Sampson's, Guernsey.

Gammaropsis maculata, Johnston. Jersey (N., S. & H.).

Microprotopus maculatus, Norman. Guernsey (N.); Jersey (*Chevreaux*).

— *longimanus*, Chevreux. Herm and Guernsey.

Photis longicaudata, Bate. Guernsey (N.); Jersey, off La Rocque (S. & H.).

Podocerosis Sophieæ, Boeck. Jersey (S.).

Megamphopus cornutus, Norman. Guernsey (W.); Jersey (W. & H.).

Amphithoe rubricata, Montagu. Guernsey and Jersey.

Pleonexes gammaroides, Bate. Guernsey and Jersey.

Sunamphithoe pelagica, H. M.-Edwards, = *S. conformata*, Bate. Guernsey (N.); Jersey (*Chevreaux*).

Bruzeliella falcata, Montagu. Jersey.

— *ocia*, Bate. One male, Jersey (W. & H.).

Jassa pelagica, Leach, = *Podocerus capillatus*, B. & W. Among *Styelopsis*, Jersey (*Kæhler*).

Erichthonius abditus, Templeton. Guernsey (N.); Jersey (S. & H.).

— *Hunteri*, Bate. Guernsey.

— *difformis*, H. M.-Edwards. Jersey (S.).

Cerapus crassicornis, Bate. Jersey (S.).

Corophium volutator, Pallas, = *C. longicorne*, Latreille. Guernsey (N.); Jersey (S. & H.).

— *crassicorne*, Bate. Jersey (S.).

— *Bonelli*, H. M.-Edwards. Guernsey (W.).

Unciola crenatipalmata, Bate. Guernsey, in Fermain Bay in 1906, and also taken in 1865.

Chelura terebrans, Philippi. Jersey (W. & H., S.).

Dulichia porrecta, Bate. Between the Castle and St. Martin's Point, Guernsey (W.); Jersey (W. & H., S.).

Platophium Darwini, Bate. Guernsey (N.); Jersey, tide-marks (W.).

Phthisica marina, Slabber. Guernsey and Jersey.

Pseudoprotella phasma, Montagu. Jersey (Köhler).

Periambus typicus, Kröyer. Guernsey (N.); Jersey (S.).

Caprella tuberculata, Guérin. Guernsey.

— *linearis*, Linné. Guernsey (N.); Jersey (W.).

— *acanthifera*, Leach. Common, Jersey (S. & H.).

—, var. *levissima*, Mayer. Guernsey (N.).

— *acutifrons*, Latreille. Jersey (W. & H.).

OSTRACODA.

The following list contains the species known to me from the Channel Isles. The freshwater species have not been sought for, except the very fine *Cypris bispinosa*, which was sent to me many years ago by the late Dr. Lukis of Guernsey. The species which have the letter *B* after them are inserted on the authority of Dr. G. S. Brady; the rest have been found by myself.

Cypris bispinosa, Lucas.

Paracypris polita, G. O. Sars.

Pontocypris trigonella, G. O. Sars.

Erythrocypris mytiloides, Norman.

Argylloëcia cylindrica, G. O. Sars.

Bairdia acanthigera, G. S. Brady.

— *inflata*, Norman. B.

Cythere lutea, O. F. Müller.

— *cyamos*, Norman.

— *confusa*, Brady & Norman.

— *pellucida*, Baird.

— *porcellanea*, G. S. Brady.

— *tenera*, G. S. Brady.

— *badia*, Norman.

— *crispata*, G. S. Brady.

— *Robertsoni*, G. S. Brady.

— *convexa*, Baird.

— *marginata*, Norman.

— *albomaculata*, Baird.

— *cuneiformis*, G. S. Brady. B.

— *villosa*, G. O. Sars.

— *Jeffreysi*, G. S. Brady. B.

Cythere finmarchica, G. O. Sars.

— *tuberculata*, G. O. Sars. B.

— *runcinata*, Baird.

— *antiquata*, Baird.

Cytheridea elongata, G. S. Brady.

— *torosa*, T. R. Jones.

Eucythere declivis, Norman.

Loxoconcha impressa, Baird.

— *viridis*, O. F. Müller.

— *multiflora*, Norman.

— *tamarindus*, T. R. Jones.

— *guttata*, Norman.

Xestoleberis aurantia, Baird.

— *labiata*, Brady & Robertson.

— *depressa*, G. O. Sars.

Cytherura nigrescens, Baird.

— *cornuta*, G. S. Brady.

— *sella*, G. O. Sars.

— *acuticostata*, G. O. Sars.

— *angulata*, G. S. Brady.

— *producta*, G. S. Brady.

— *fulva*, Brady & Robertson.

Cytherura striata, *G. O. Sars*.
 — *cellulosa*, *Norman*.
Bythocythere constricta, *G. O. Sars. B.*
Pseudocythere caudata, *G. O. Sars*.
Sclerochilus contortus, *Norman*.
Cytherideis subulata, *G. S. Brady*.
Machærina amygdaloides, *G. S. Brady*.
Paradoxostoma variabile, *Baird*.
 — *ensiforme*, *G. S. Brady*.
 — *abbreviatum*, *G. O. Sars*.

Paradoxostoma obliquum, *G. O. Sars*.
 — *pulchellum*, *G. O. Sars*.
 — *fasciatum*, *Brady & Norman*.
 — *Normani*, *G. S. Brady*.
 — *hibernicum*, *G. S. Brady*.
 — *orchadense*, *Brady & Robertson*.
 — *flexuosum*, *G. S. Brady*.
Philomedes interpuncta, *Baird*.
Asterope Mariæ, *Baird*.
 — *teres*, *Norman*.

COPEPODA.

In the commencement of this paper it is mentioned that my late friend Mr. Isaac C. Thompson recorded thirty-one species of Copepoda from Channel Island plankton. On the Harpacticoida and fish-parasites nothing has been published, and the few species in my own collection are not worth recording. It is probable that many minute species new to our fauna will hereafter be found in what may be expected to prove a very rich district. It is to be hoped that some naturalist with good eyes and a steady hand will before long work at these minims. But very much remains to be done in other orders, especially among the Sympoda and Ostracoda.

EXPLANATION OF THE PLATES.

PLATE XVI.

- Fig. 1. Gammarus Berilloni*, Catta.
Fig. 2. Ditto. Last uropod.
Fig. 3. Microdeutopus gryllotalpa, Costa. First gnathopod (♂), from Valencia, Spain.
Fig. 4. Microdeutopus stationis, Della Valle. Second gnathopod (♂).

PLATE XVII.

- Fig. 1. Metopa sarniensis*, sp. n. First gnathopod.
Fig. 2. Ditto. The distal joints of the same, more magnified.
Fig. 3. Ditto. Second gnathopod.
Fig. 4. Ditto. The distal joints of the same, more magnified.
Fig. 5. Ditto. The last pereopod.
Fig. 6. Microdeutopus gryllotalpa, Costa. Secondary flagellum of antennule.
Fig. 7. Ditto. Distal portion of first gnathopod (♂), from Plymouth.
Fig. 8. Microdeutopus stationis, Della Valle. Secondary flagellum of first antennule.
Fig. 9. Ditto. First gnathopod (♂).
Fig. 10. Ditto. Ditto, to show variation.
Fig. 11. Ditto. First gnathopod (♀).

BIBLIOGRAPHICAL NOTICES.

100 *Photographs from Life*. (No. 1.) By DOUGLAS ENGLISH.
London: Bousfield & Co., 1907.

THIS is a really wonderful shilling's worth, containing most charming pictures of shrew-mice, dormice, house- and field-mice, and the meadow-mouse.

In some thirty pages of text the Author briefly enumerates the salient points of each species and the more interesting facts with regard to the life-history of each. Accurate and pleasantly written, this addition to the volume will be most welcome.

100 *Photographs from Life*. (No. 2.) By R. B. LODGE.
London: Bousfield & Co., 1907.

MR. R. B. LODGE has earned for himself a considerable reputation as a bird-photographer, and this is thoroughly well sustained in this little booklet—a companion volume to that on the Rodents.

Though all the pictures herein reproduced have appeared elsewhere, they will find a no less hearty welcome among bird-lovers on this account.

Mr. Lodge's notes on the habits are extremely interesting, and not less so because he has included therein many details concerning the making of his pictures.
W. P. P.

Les Débuts d'un Savant Naturaliste, le Prince de l'Entomologie, Pierre André Latreille, à Brive, de 1762 à 1796. Par LOUIS DE NUSSAC, Sous-Bibliothécaire du Museum d'Histoire naturelle. 8vo. Paris, 1907. Pp. 264.

LATREILLE is not the least distinguished among the numerous French clerics who have done so much good work in entomology for more than a century, and we may also mention Engramelle, Lacordaire, David, and Joannis. At a time when entomology was in its infancy in Britain, Latreille laid the foundations of the science deeply and firmly in the sixteen volumes of his '*Histoire naturelle, générale et particulière des Crustacés et des Insectes*,' published between 1802 and 1805.

But the interesting work before us deals only with the earlier part of his life, before the publication of his principal works; for, though he had previously published several entomological papers, his '*Précis*,' the first of the long series of books which made his name famous, did not appear till 1796. He was born at Brive in 1762, and died in Paris in 1833.

We do not propose to speak of Latreille's career further, except to relate again one of the most interesting episodes of his early life. At the time of the French Revolution, Latreille, who had

risen to the dignity of an Abbé, was thrown into prison and conveyed to Bordeaux for deportation to Cayenne, with other offenders guilty of belonging to the priesthood. During the visit of a surgeon to the prison the latter saw Latreille pick up an insect and look at it carefully. "Is it rare?" he asked. "Yes," said Latreille. "Give it me," said the surgeon, "for I have a friend who is interested in insects." "Take it, and ask him to give me its name," said Latreille. But the surgeon brought back the reply that he could not discover the name, and that it was probably a new species; and then Latreille gave him a message to his friend Bory de St. Vincent, a man of considerable influence, who was able to exert it to release him from his imprisonment, and thereby saved his life, for the vessel in which he was to have sailed was lost with all on board, except some of the crew, who escaped in a boat. The insect, the capture of which led to such important results, was *Necrobia ruficollis*, Fabricius, a small beetle belonging to the Malacodermata.

EDM. BORDAGE. *Recherches anatomiques et biologiques sur l'Autotomie et la Régénération chez divers Arthropodes.* (Reprinted from 'Bulletin scientifique de la France et de la Belgique,' vol. xxxix. 1905, pp. 307-454, pl. vi. & 20 text-figs.)

A TREATISE on the power possessed by various insects (especially Phasmidæ) of reproducing lost limbs, either when a limb has been cast by the insect itself to facilitate its escape from an enemy, or when a limb has been injured, or amputated for experimental purposes. The author is the Director of the Museum of Natural History in the island of Réunion, and has paid special attention to the question in the case of two large Phasmids (*Monandroptera inuncans*, Serv., and *Rhaphiderus scabrosus*, Serv.) which inhabit that island. The brochure will be very interesting to entomologists who occupy themselves with insect physiology.

The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by Lt.-Col. C. T. BINGHAM. — *Butterflies.* Vol. II. By Lt.-Col. C. T. BINGHAM. London: Taylor & Francis, 1907. 8vo. Pp. viii, 480; pls. xi.-xix.

THE second volume of this important work includes the Papilionidæ, the Pieridæ, and the following five subfamilies of Lycenidæ:—Gerydinæ, Lyceninae, Curetinæ, Liphyrinæ, and Poritiinæ. Two more subfamilies of Lycenidæ (Arhopalinae and Theclinae) remain over till the next volume.

It will thus be seen that the volume includes a considerable portion of the most conspicuous and interesting butterflies. In the Papilionidæ six genera are included—*Armandia*, *Leptocircus*, *Timo-*

palpus, *Papilio*, *Parnassius*, and *Hypermnestra*; the 76 species of *Papilio* not being broken into small genera, as was attempted by F. Moore and others, but arranged in 26 groups, according to the scheme of Felder, as expanded by the Hon. W. Rothschild, even *Ornithoptera* being treated simply as a group. In the Pieridæ and Lycænidæ the genera are much more numerous, and seldom include many species.

Comparatively few European species extend to India; but it is worthy of note that of the twelve Indian species of *Pieris* seven are European, including our three common Whites and *Pieris daphidice*. Our two Clouded Yellows are also among the nine Indian species, the only other European *Colias* found in India being an Alpine form of the Polar *Colias nastes*. Our Clouded Yellows stand as *C. hyale*, Linn., and *C. croceus*, Fourcroy.

The section on Lycænidæ includes much that will be read with great interest respecting the relations between these butterflies and ants.

The letterpress is written with great care, and it would be difficult to overestimate the value of this book either to collectors in the field or to home students of butterflies. The illustrations are all by Horace Knight, and include 10 plates, excellently reproduced in colour-photography, and 104 (often multiple) numbered figures in the text.

W. F. K.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

February 6th, 1907.—J. E. Marr, Sc.D., F.R.S.,
Vice-President, in the Chair.

The following communication was read:—

‘Note on the Cervical Vertebra of *Zeuglodon* from the Barton Clay of Barton Cliff (Hampshire).’ By Charles William Andrews, B.A., D.Sc., F.R.S., F.G.S.

The Author gives a brief description of a cervical vertebra from the Barton Clay of Barton Cliff. It is referred provisionally to *Zeuglodon Wanklynii*, a species described in 1876 by Prof. H. G. Seeley. The skull on which this description was founded is totally lost, so that this vertebra is the only bone of a *Zeuglodon* from the Barton Clay, and, with the possible exception of a vertebra from the Brockenhurst Beds (which is the type of *Balenoptera Juddi*), the only one found in the British Isles that now exists.

May 1st, 1907.—Sir Archibald Geikie, D.C.L., Sc.D., Sec.R.S.,
President, in the Chair.

The following communication was read:—

‘On the Xerophytic Character of Coal-Plants, and a Suggested Origin of Coal-Beds.’ By the Rev. Prof. George Henslow, M.A., F.L.S., F.G.S.

Of the Palæozoic flora, the *Equisetites*, now represented by the solo genus *Equisetum*, are decidedly hygrophytic, if not hydrophytic. The Ferns, which appear to have much resemblance to certain modern types, especially the *Marattiæ*, seem to have lived under more or less similar conditions to the present; that is, varying from the hygrophytic habit of *Hymenophyllum* to the xerophytic *Ceterach*. The *Cycadofilices*, *Cordaites*, etc. are decidedly xerophytic; and the same is the character of the *Lycopodiales*, represented now by *Lycopodium* and *Selaginella*, and of *Psilotum*, *Salisburya*, and others. In fact, the characteristic feature of the great coal-forests was xerophytic, and the vegetation appears to be of an upland type. Illustrations are given from recent and Carboniferous plants, to show the characters of leaf, root, and stem which separate these classes of plants. The position of coal-seams is accounted for by the action of earth-movements in late Carboniferous times: these threw the forest-bearing surface into shallow waves and troughs, which became gradually accentuated, the latter being gradually filled with sediment, upon which, during intervals of rest, new forest-growth took place.

June 5th, 1907.—Sir Archibald Geikie, D.C.L., Sc.D., Sec.R.S.,
President, in the Chair.

The following communications were read:—

1. ‘A Marine Fauna in the Basement-Beds of the Bristol Coalfield.’ By Herbert Bolton, F.R.S.E., F.G.S.

Isolated and rare fossils have been occasionally discovered in the Bristol Coalfield, but the list of genera and species hitherto recorded is a short one. During the progress of an exploration-branch at the Ashton-Vale Colliery, fossiliferous shales were traversed in the lowest Coal-Measures resting upon the Millstone Grit. A section of the Coal-Measures in this part of the Coalfield is given, the Gays Seam being the lowest workable seam, and the chief fossiliferous shale is localized at a depth of 84 feet below it. The most striking feature of the fossils is their dwarfed condition, especially among the fish-remains. Fossils found in the spoil-banks of other pits indicate that other marine horizons occur in the Coalfield. The thickness of the Millstone Grit appears to be about 980 feet. The palæontological description embodies a tabular list of fossils from the marine horizon, which shows a close correspondence with the list drawn up from the marine beds associated with the Gin Coal of

North Staffordshire ; but it does not appear to be desirable to conclude that the horizons are identical, until further evidence of faunal development has been obtained from the Bristol area. The brachiopod-fauna contains forms identical with, or closely approximating to, species occurring in the *Cyathaxonia*- and *Dibunophyllum*-Zones.

The palæontological description contains an account of the different species collected, including notes on *Productus*, *Chonetes*, *Derbya*, and *Orthothetes*, contributed by Dr. A. Vaughan, and new species of *Chonetes*, *Raphistoma*, and *Loxonema*.

2. 'Brachiopod Morphology: *Cincta*, *Eudesia*, and the Development of Ribs.' By S. S. Buckman, F.G.S.

The test-ornament of brachiopods is found in three main phases : smooth, ribbed, and spinous ; and of these three, a costate species is more advanced than a smooth one, and less advanced than a spinose one. There are catagenetic developments, also, in reverse order ; but these may, for the present, be neglected. Dall has stated that *Cincta* (*Terebratula-numismalis* Group) is a synonym of *Eudesia* (*T.-cardium* Group) ; but, although it would be quite possible for costate forms to be developed from the smooth *Cincta*, yet they would not be costate forms of the *Eudesia*-type : in the *Cincta*-type the costæ developed would be of the kind which produced opposite carination of both valves, while in *Eudesia* the costæ on the two valves are alternate, the carinae of one valve being opposed by sulci in the other. This fundamental difference not only prevents the inclusion of *Eudesia* and *Cincta* in one genus, but shows that they belong to entirely different series. The first phase of development dealt with may be called the lenticular stage, which might develop in either of the two directions indicated. The next phase would be the *Cincta*-stage, in which the front margin is rounded in youth, truncate in adolescence, incipiently excavate and bilobate in the adult, as the growth-lines of the specimens show. The *Cincta*-stage may develop in two directions—out of broad forms the quadrifid stage, out of narrow forms the cornute stage. The next development may be called the quadricarinate or trigonellid stage ; and the fourth stage, the multicarinate or *pectunculus*-stage. In *Eudesia* there is a highly-developed multicarinate stage, but the carinae are alternate, not opposite. In degree of ribbing it is higher than *Cincta*, and in a way even higher than the *pectunculus*-stage ; but both the ribbing and the loop forbid connexion with *Cincta*. The preceding stage is exemplified by *Ismenia pectunculoides*. A prior stage may be seen in *Megerlia Munieri* ; and, as an example of the incipient uniplicate stage, *Terebratula Whitakeri* may be given. Certain emendations in nomenclature appear to be necessitated as a result of this communication ; new names are given, and their application defined. A Table is added to show the successive stages of development along the two lines.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 119. NOVEMBER 1907.

XLVIII.—*Preliminary Notice of new and remarkable Cephalopods from the South-west Coast of Ireland.* By A. L. MASSY, Department of Agriculture and Technical Instruction, Fisheries Branch, Dublin.

THE species mentioned below were all met with at 50 to 70 miles off the south-west coast of Ireland, and form part of a collection made by the Fisheries Cruiser 'Helga' during the years 1901 to 1907. A detailed report of the whole collection, with illustrations of the new species, is in preparation and will appear in the "Scientific Investigations" of the Fisheries Branch of the Department.

Family Polypodidæ.

Genus POLYPUS, J. G. Schneider.

Polypus profundicola, sp. n.

Head slightly narrower than body. Eyes large and prominent. A few slightly marked tubercles usually present round each eye. Skin otherwise smooth in all parts. Arms somewhat slender, largest at the base, tapering gradually to very fine points. Order 1, 2, 3, 4. Their length is on an average six times longer than the body. Ventral arms the slightest, the others not differing much in bulk. Suckers sessile with circular aperture, and radial grooves extending almost to the

margin. Suckers relatively small and placed rather far apart, especially in the distal half of umbrella region. The space here between two suckers frequently twice the diameter of either sucker. Suckers of extremities of arms perfect, not reduced to papillæ, and extending to within less than half a millimetre from tip of arm. Web much developed, extending nearly one quarter the length of arms. Least development between ventral arms. Web continued on arms in the form of large lateral crests. Radula formed of 7 series of teeth: 1 median, 4 lateral, and 2 marginal. Dental formula 3 2 2 1 2 2 3. Median row consisting of large acute teeth without lateral denticles. Inner lateral teeth much the smallest, broad at the base, terminating in short conical points. Outer lateral teeth broader and more elongated. Marginal teeth elongated and claw-like. Siphon moderately large. Organ of siphon consisting of a pair of heart-shaped folds, of which the thickened rims are continuous and distinctly projecting all round. Mantle bursiform. Pallial aperture not as large as head. Body soft. Lateral adductor muscles in form of flat bands placed rather close together, the anterior much the smallest, the posterior reaching their greatest width in the portion attached to the body. The two cartilaginous pieces in the dorsal mantle are long and rod-like; they are widest in the anterior portion. The ligula copulatoria* of the hectocotylized arm has from eight to nine laminæ copulatoriæ in the concave interior, in the median portion of which there is a flat-topped longitudinal ridge. Calamus brachialis moderately short. Sperm-canal smooth, shallow, and like a white band on surface of arm. General colour vinous, due to an immense number of small light and dark purple and dark red chromatophores distributed on a white ground. *Polypus profundicola* appears to be very nearly allied to *Octopus ergasticus*, Fischer, particularly in the form of the hectocotylized arm. The ligula copulatoria is, however, only crossed by 6 or 7 laminæ in *O. ergasticus*. The hectocotylus is also larger in proportion in *P. profundicola*, and the arms are longer, and with smaller and more numerous suckers. The web is also more developed, forming large crests on the arms, and the siphon projects much less. The specimens examined consist of 7 males and 7 females, obtained in the trawl at 385-720 fath. The principal dimensions of a large male and female are given below.

* The terms used in describing the different parts of the modified arm are those suggested by P. and J. Fischer in "Diagnoses d'espèces nouvelles de Mollusques Céphalopodes recueillis dans le cours de l'Expédition scientifique du *Talisman*" (1883), Journ. de Conch. 1892, xxxii. p. 297.

Dimensions. ♂.

| | mm. |
|------------------------------------|------------------|
| Total length | 582 |
| End of body to mantle-margin | 103 |
| " " eye | 111 |
| Breadth of body | 70 |
| " head | 62 |
| Eye to edge of umbrella | 102 |
| Diameter of largest sucker | 4 |
| Length of arms* :— | |
| 1st on right 471 mm. | 1st on left 460 |
| 2nd " 440 " | 2nd " mutilated. |
| 3rd " 264 " (hect.). | 3rd " ditto. |
| 4th " 370 " | 4th " 327 |

Approximate number of suckers, 1st arm on right, 254.

Dimensions. ♀.

| | mm. |
|--|-----------------|
| Total length | 457 |
| End of body to mantle-margin | 62 |
| " " eye | 78 |
| Breadth of body | 50 |
| Eye to edge of umbrella | 105 |
| Diameter of largest sucker, nearly | 4 |
| Length of arms :— | |
| 1st on right 377 mm. | 1st on left 379 |
| 2nd " 370 " | 2nd " 371 |
| 3rd " 290 " | 3rd " 312 |
| 4th " 238 " | 4th " 290 |

Approximate number of suckers, 1st arm on right, 218.

Polypus Normani, sp. n.

Head rather broader than body. Eyes large and prominent, circumference of aperture in the type 11 mm. A number of deep wrinkles extend across the surface between eyes, originating from dorsal side of eye-aperture. Surface otherwise smooth in all parts. Arms 4-sided and keeled, somewhat slender, largest at the base, tapering gradually to very fine points, and arranged in the order 1, 2, 3, 4. Arms about four times the length of body, the two dorsal pairs more bulky than the rest. Suckers sessile, large, and with the arrangement in the centre of arm noticed by M. Joubin in *O. levis* †. Each sucker with circular aperture and numerous radial

* The arms are measured from the mouth.

† " Entre les ventouses, sur la face orale des bras, on voit une crête peu saillante mais bien nette qui passe d'une ventouse de droite à celle immédiatement supérieure à gauche, puis de là revient à droite et ainsi de suite. L'ensemble de cette disposition a l'aspect d'un lacet reliant alternativement deux rangées de boutons." Campagnes Scientifiques du Prince de Monaco. Fascicule xvii. (1900): Céphalopodes provenant des campagnes de la Princesse Alice (1891-1897), par Louis Joubin.

grooves, the first two usually placed singly, remainder arranged in pairs, the seventh or eighth pair (about centre of web in type) usually the largest, gradually diminishing towards tip, where they are very small but not reduced to papillæ. In the type the suckers extend to within about 2 mm. of the extremity of each arm. Web much developed, extending about one quarter the length of the arms. Maximum development between the dorsal pairs, least development between the ventral arms. Web not continued on arms. Buccal membrane and mandibles apparently very small, almost concealed in the type by the basal suckers. Siphon moderately large, extending rather more than one third of the distance between pallial aperture and web between ventral arms. Mantle bursiform and somewhat pointed posteriorly, its aperture exactly the width of basal portion of head. Body firm. The calamus brachialis of the hectocotylyzed arm short and but little projecting; ligula copulatoria narrow and pointed, the deeply concave interior looking like a longitudinal groove, and crossed by nine slightly defined laminæ copulatoriæ. Sperm-canal extending to umbrella-margin, quite shallow and like a narrow gradually widening white band, smooth except for a few faint grooves at a little distance from the calamus brachialis. The end of hectocotylyzed arm when viewed in profile much resembles that of *O. polyzenia**, except that the point of the calamus brachialis is not quite so acute. Colour much like that of *P. profundicola*, but of a warmer tone. Dorsal surface of body, head, and web the darkest; arms, inner and under surface much lighter, with patches of bluish grey on web between each arm on ventral side. The only specimen of this graceful-looking form was taken in the sprat-net on trawl at 707-710 fath.

Dimensions.

| | mm. |
|--|-----|
| Total length..... | 206 |
| End of body to mantle-margin | 29 |
| " " centre of eye | 42 |
| Breadth of body | 30 |
| " head | 32 |
| Centre of eye to lateral edge of umbrella .. | 50 |
| Length of calamus brachialis | 1 |
| " ligula copulatoria | 3 |
| Breadth of ligula copulatoria | 2 |
| Diameter of largest sucker..... | 4 |
| Siphon projects above mantle-margin | 15 |
| Diameter between eyes | 26 |

* Report on the Zoological Collections made in the Indo-Pacific Ocean during the Voyage of H.M.S. 'Alert,' 1881-2. Mollusca (by E. A. Smith), pl. iv. A³.

Length of arms:—

| | | | |
|--------------|---------------|-------------|-----|
| 1st on right | 157 mm. | 1st on left | 158 |
| 2nd | 147 " | 2nd | 152 |
| 3rd | 95 " (hect.). | 3rd | 147 |
| 4th | 133 " | 4th | 133 |

Approximate number of suckers, 1st arm on right, 144.

Family Gonatidæ.

Genus GONATUS, Gray, 1849.

Gonatus Fabricii, Lichtenstein.

Nine specimens taken in the trawl at depths varying from 465–666 fath. All were examined without success for any trace of a hectocotylus. The largest specimen measured 275 mm. in length, and the smallest 118 mm. Not met with before in British-and-Irish waters.

Family Enoploteuthidæ.

Genus OCTOPODOTEUTHIS, Rüppell, 1884.

Octopodoteuthis sicula, Rüppell, 1884.

A specimen taken in the trawl at 550–570 fath. This individual agrees closely with Dr. Jatta's description. The tips of all the arms being mutilated, the sex cannot be determined without injury to the specimen. This species appears never to have been met with outside the Mediterranean before, or of such a size. It measures 117 mm. across the fins; from end of body to mantle-margin 107 mm.; from end of mantle-margin to bifurcation of first pair of arms 35 mm.

The siphon projects 17 mm. above the mantle-margin. No trace exists of the roots of the tentacles, which in this species are moulted or re-absorbed in youth.

Family Histioteuthidæ.

Genus HISTIOTEUTHIS, Orbigny.

Histioteuthis bonelliana, Férussac.

Two specimens. One with a total length of 31 mm. was taken in the triangle net at 70–80 fath. from the surface over soundings of about 800 fath. The other measures 129 mm. and was taken in the sprat-net on trawl at 775–795 fath. The smaller specimen possesses no trace of web between the arms, or of the black elongate swellings present in the larger specimen at the tips of all except the ventral arms.

Not previously recorded from British-and-Irish waters.

Family **Cranchiidae**.Genus **HELICOCRANCHIA**, gen. nov.

Body elongated, chalice-shaped, tapering gradually to a rounded point. Mantle-substance tough, smooth, pale, with many small chromatophores. Fins considerable, oval, pedunculate, attached to end of dorsal surface of body. Eyes sessile, large, in the form of a low cone. Arms rather long, with keel and lateral membrane moderately developed. Tentacles long and expanded into a club. Siphon extremely large.

Helicocranchia Pfefferi, sp. n.

Body broadest in the middle, tapering gradually, and rounded posteriorly. Breadth of body rather less than half the length of mantle. Surface smooth; colour creamy white; dorsal surface closely freckled with dull red oblong chromatophores arranged irregularly; ventral surface and sides with eight transverse rows of chromatophores, as well as a number of spots arranged in no particular order. Fins narrowly pedunculate, broadly pyriform in outline, somewhat fleshy, rather more than one fifth the length of the mantle, attached to dorsal surface close to (in type at 1 mm. from) posterior end of body. Mantle-margin depressed in middle line dorsally and there joined to siphon. Eyes sessile, large; their visual parts in the form of a low cone, of which the posterior face is occupied by a large bluntly conical process. Towards the posterior end of each eye is an oblong, soft, white papilla, possibly the olfactory papilla. Buccal membrane mutilated in the type, but apparently seven-angled. Siphon extremely large, extending about two thirds of the length of the ventral arms. The arms are about one third as long as the mantle. They are unequal, the apparent order of length being 3, 2, 1, 4 *, slender and tapering, with transparent keel moderately developed on distal two thirds of all, but least developed on dorsal arms. Lateral membrane moderate, extending entire length of arms. Margin usually straight. The arms appear to be quite free. The suckers are stalked and arranged in two rows until the distal third of arm is reached, when they suddenly become very minute, crowded, and arranged irregularly. These minute suckers are stalked and have a circular aperture; towards the extreme tip they appear to be imperfectly formed. The large suckers have a circular horny ring and about four rows

* Tips of ventral arms absent.

of papillæ. The latter when they cross the edge look like teeth. The tips of the ventral arms being absent in the type, it is not possible to say if the small suckers are present on these arms also. The suckers on all the arms are placed furthest apart on the proximal portion, gradually becoming placed closer together and reaching their maximum size just before the commencement of the distal third, where they are abruptly succeeded by the tiny suckers. The large suckers of the dorsal arms are smaller in proportion than those of the other arms. The tentacles are long, slender, and round. When bent back they extend rather more than three quarters of the length of the mantle. The stem is thickest at its base, whence it narrows gradually but considerably, again expanding into a club furnished with moderate swimming-crest and lateral membrane. The suckers of the club are in four rows, of which the two median are perhaps slightly the largest. About 60 suckers are present on each club, all with circular horny ring, with about four rows of papillæ. About 16 pairs of minute suckers occur on the inner surface of the stem, placed close together near the club, becoming gradually more distant. Apparently none are modified into fixing-pads. There are none on the proximal portion of the stem, which is quite smooth in the type for the last 10 mm. Organ of siphon consisting of two quadrangular folds on sides and a median dorsal organ; the latter is composed of a thin plate occupied by an anterior and two lateral tubercles. From the anterior tubercle on pressure a needle-like process appeared, in the type extending a length of 1 mm. Similar processes claw-like in shape are situated in each of the lateral tubercles. The specimen was taken in the trawl at 350 fath.

Dimensions.

| | mm. |
|--|----------------|
| Total length..... | 80 |
| End of body to mantle-margin dorsally | 39 |
| " " top of eye | 41 |
| Breadth of body | 18 |
| " head between eyes | 3 |
| " " across eyes | 10 |
| Length of fin | 7 |
| Breadth of fin | 7 |
| " (diameter) of peduncle of fin | 2 |
| Length of arms :— | |
| 1st on right 11 mm. | 1st on left 11 |
| 2nd " 13 " | 2nd " 13 |
| 3rd " 14 " | 3rd " 14 |
| 4th " 9 " | 4th " 8 |
| Length of tentacle | 37 |

The arms were measured from the mouth, but the arm-measurements must be considered only approximate, as, with the exception of the first and third arms on the left, the extreme tips are missing.

XLIX.—On the Geographical Races of the Lesser Horseshoe Bat (*Rhinolophus hipposiderus*). By KNUD ANDERSEN.

IN a paper published two years ago in the 'Proceedings of the Zoological Society of London' (1905, ii. pp. 139-144) I pointed out the existence of three geographical races of the Lesser Horseshoe Bat, viz. a small southern form (*Rh. h. minimus*), distributed, broadly speaking, over the Mediterranean Subregion, south-eastwards to Sennaar and Keren; a large northern form (*Rh. h. hipposiderus*), ranging, broadly speaking, from the extreme N.W. Himalayas (Gilgit), through N.W. Persia and Armenia, over the whole of Central Europe N. of the Balkans and the Alps; thirdly, a form (*Rh. h. minutus*) apparently confined to England, Wales, and Ireland. The southern differs from the northern form, I wrote, in being in every respect smaller—in some respects, as it seems, absolutely smaller, in others at least on an average; I found the length of the forearm to be the most convenient means for a ready discrimination: in *minimus* 34·7-38 mm., in *hipposiderus* 39-41·7. As to the characters of the English form, they have no bearing on the subject-matter of this paper, and are therefore left entirely out of consideration here. My conclusions were based on an examination of ninety-five adult specimens, mostly from the collection of the British Museum, and obtained in localities dotted over practically the whole area occupied by the species.

Since I wrote that paper several other specimens, partly material added to the British Museum collection, partly examples sent for inspection and identification by correspondents here and abroad, have passed through my hands. Every specimen has agreed precisely with the characters pointed out by me, with the exception of three, *all of which are from a place in which I had already predicted* that both forms or intermediate individuals would most probably be found.*

* "I have some reason to believe that in certain border districts (*e. g.* S.W. Switzerland . . .) the two forms occur together, perhaps side by side, but intermediate examples I have never seen. They will probably be found." (Proc. Zool. Soc. 1905, ii. p. 141.)

In the 'Mémoires de la Société zoologique de France' (1907, pp. 21-22) M. Charles Mottaz, Geneva, records the results of an examination of 169 specimens of the Lesser Horseshoe (presumably obtained at or near the place where he lives or somewhere else in Switzerland, though this is not stated in his paper) as follows :—"Jusqu'ici le résultat de cette étude nous laisse perplexe et ne saurait nous convaincre de la validité de la sous-espèce *minimus*. En effet, sur 169 sujets actuellement entre nos mains, mesurés et scrupuleusement étudiés, nous avons dû constater que : 1°. Ceux qui répondaient aux caractères du *minimus* ou qui pouvait être taxés d'intermédiaires étaient tous, jeunes [*sic*] et vieux, des ♂. 2°. Ceux qui furent classés *hipposideros* étaient tous, jeunes [*sic*] et vieux, des ♀. Que conclure? Y a-t-il coïncidence fortuite, ou plutôt la différence signalée serait-elle seulement une question de sexe? Pour l'instant nous ne saurions enregistrer définitivement le *Rh. hipposideros minimus* dans notre faune suisse ni admettre la validité de cette sous-espèce tout au moins pour ce qui concerne les représentants de notre région."—In a few words: M. Mottaz has come to the conclusion that what I have taken to be a difference between a southern and northern form of this bat is, in reality, at least in Switzerland, a sexual difference only.

Although it must be granted, I think, that in committing a mistake of such kind as suggested by M. Mottaz I should have made myself guilty of an almost unthinkable carelessness (a quality of which, I hope, my zoological papers do not in other respects bear too abundant witness), and at the same time been singularly unfortunate in having had before me from the whole area inhabited by *minimus* males only, and from the whole area of *hipposiderus* females only; although M. Mottaz, in dealing with a question of *size* in a series of individuals, does not give any measurements at all to enable the reader to control the correctness of his results; although M. Mottaz, in discussing a question for the decision of which it is of the highest importance to know the exact places in which he obtained the individuals examined, does not give a single locality (they were "recueilli . . . partout," is the only information given, so that it cannot even be seen with certainty whether they were obtained "partout" in Switzerland or "partout" in Europe generally); although, therefore, his two "conclusions," as given in his paper, are merely postulates not supported by a single fact or figure; although the insertion of the word "jeunes" in both of his conclusions admits of one explanation only, viz. that M. Mottaz lacks the necessary training in dealing with questions of this

kind (for, inasmuch as the difference between *minimus* and *hipposiderus* is a well-marked but small difference of *size*, nobody would, of course, be able to tell whether a *young* individual, obtained in a region where we have all reason to believe that *both forms* occur, is referable to the one rather than to the other form).—I shall now, in the interests of the subject, challenge his conclusions and prove, by means of indisputable figures and facts, that M. Mottaz's result, strange as it is, is totally wrong as well. Strictly speaking I cannot, of course, prove anything about the very specimens examined by M. Mottaz, and which I have not seen, but this is also not necessary; if only I succeed in proving, on the basis of the large British Museum series, the validity of the characters of *minimus* and *hipposiderus*, and their perfect independence of the sex of the individuals, then M. Mottaz will get nobody to believe that what in southern as compared with northern specimens of the Lesser Horseshoe is a well-marked *racial* difference, is in Switzerland transformed into a *sexual* difference.

Subjoined I give the locality, sex, and length of forearm of all the full-grown examples of *minimus* and *hipposiderus* which I have had the opportunity of examining up to this moment. Be it noted that the measurement of the forearm has been taken from the most backward projecting point of the forearm to the *front curve of the carpus* (wing folded). All the measurements are of perfectly adult specimens, with one exception, mentioned below.

Rh. h. minimus.

Erythrea: Keren.—One male, young adult, type of *Rh. minimus*, Heuglin: 36·3 mm. (The not quite consolidated condition of the finger-joints of this individual proves *it* to be slightly immature; it is, however, in all probability full-grown; I give the measurement here only because this example is the type specimen.)

Sennaar.—One female: 36·5.

Cyprus.—Five males: 34·7, 35·8, 36·0, 36·8, 37·2; one female: 37·7.

Smyrna.—One female: 37·5.

Crete.—One male: 35·5.

Malta.—Four males: 36·0, 36·2, 36·3, 36·9; two females: 36·0, 36·0; two unsexed: 36·0, 37·0.

Sicily: Ficuzza.—One male: 35·7; four females: 36·2, 36·2, 36·8, 36·8.

Middle Italy: Ostia.—Two unsexed: 35·7, 36·8.

Sardinia: near Siliqua.—One male: 36·7; one female: 37·8.

Corsica.—Three males: 37·8, 37·8, 38·0; one female: 37·7.

Balearics.—Four males: 36·2, 36·6, 36·8, 36·9; three females: 36·8, 37·6, 37·6.

Spain: Seville.—One male: 37·7.

Portugal: Cintra.—One male: 36·2.

Morocco: Tangiers.—One female: 37·7.

S.W. Switzerland: St. Cergues.—One male: 37·7.

N. Switzerland: near Baar.—One male: 38·0.

Intermediate individuals (nearest to minimus).

S.W. Switzerland: Geneva.—Two males: 38·2, 38·7. (In one of these specimens (no. 6. 2. 6. 3; forearm 38·7) the right elbow is damaged, and I do not feel quite satisfied that the same is not the case with the left elbow.—A third Geneva specimen in the collection, also a male, is slightly immature, but probably full-grown; its forearm measures 38·2.)

Rh. h. hipposiderus.

Gilgit.—One male: 39·8.

N.W. Persia: Urmi.—One male: 39·8.

Armenia: Van.—One male: 39·2; one female: 39·3.

S. Caucasus.—Two males: 39·0, 39·8; one female: 38·7.

[Cyprus.—One female: 39·6*.]

N. Bulgaria: Rustshuk.—One male: 39·0.

Roumania.—Five males: 39·0, 39·5, 39·8, 40·0, 41·0; eight females: 39·5, 39·8, 40·0, 40·0, 40·0, 41·0, 41·0, 41·2.

Transsylvania: Kronstadt.—Two females: 40·0, 41·0.

S. Carpathians.—One male: 39·3.

Hungary: Offner Mts.—One female: 41·7.

Bavaria: Burgheim.—Two males: 39·0, 40·0; one female: 40·0.

Schlangenbad.—One male: 40·0; one female: 40·0.

N. Switzerland: Thurgau.—One male: 40·2; three females: 40·0, 40·6, 41·7.

S.W. Switzerland: St. Maurice.—One unsexed: 41·3.

The above details may be summed up in tabular form as follows:—

| | Specimens examined. | Min. | Max. | Average. |
|---------------------------------------|------------------------|-------------|-------------|-------------|
| <i>minimus</i> , males | 24 | mm. 34·7 | mm. 38·0 | mm. 36·7 |
| <i>hipposiderus</i> , males | 16 | 39·0 | 41·0 | 39·7 |
| <i>minimus</i> , females | 15 | 36·0 | 37·8 | 37·0 |
| <i>hipposiderus</i> , females | 19 | 38·7 | 41·7 | 40·3 |
| <i>minimus</i> , all examples† ... | 43 | 34·7 | 38·0 | 36·7 |
| <i>hipposiderus</i> , all examples†.. | 36 | 38·7 | 41·7 | 40·0 |

* On this specimen, see Proc. Zool. Soc. 1905, ii. p. 142, footnote †.

† Including also the few unsexed specimens enumerated above.

These figures need no comment. It is a well-known fact that in many bats females average a trifle larger than males, but so small is the average difference in size between the sexes of this species (0·3 mm. in *minimus* in favour of the females, 0·6 mm. in *hipposiderus* in favour of the same sex) that it is scarcely detectable except on careful measuring of a tolerably large series.

As already emphasized in my paper two years ago, there are certain border districts in which the two races meet and, to a certain extent, merge into one another. As yet we know exceedingly little about the exact limits of this transitional zone, but the detailed lists of specimens examined and measured, as given above, may, perhaps, throw a little light on the question. It will be noted that of the five full-grown specimens I have seen from S.W. Switzerland (St. Maurice, St. Cergues, and Geneva), one is indistinguishable from *minimus*, one decidedly a *hipposiderus*, whereas three (all from Geneva) are rather intermediate but nearest to *minimus*; of the five full-grown specimens from N. Switzerland (Baar, Thurgau), one is indistinguishable from *minimus* though having the maximum size of this form, whereas four are decidedly *hipposiderus*; the series is much too small to allow of any safe conclusions, but, so far as it goes, it shows that in S.W. Switzerland both forms occur as well as intermediate examples, in N. Switzerland *hipposiderus*, as might be expected, is the dominant form (four of five examples), whereas a small percentage (one of five) is referable to *minimus*. Although, as already said, derived from a very small series of specimens, this result will probably prove to be approximately correct, and it is so far from being unexpected that it is, on the contrary, entirely in accordance with what I could predict without hesitation two years ago. —To this I can now add one fact more: not only does *minimus* go a certain distance northward into the area of *hipposiderus*, becoming probably rarer the farther north, but I know on excellent authority* that *hipposiderus* goes a

* Dr. Senna, Florence, writes (translation from letter, Dec. 19, 1905):—“You have pointed out that *hipposiderus* ranges (so far as our continent is concerned) over Central Europe N. of the Balkans and the Alps, *minimus* over the Mediterranean Subregion. This seems to be perfectly true, generally speaking; I find, for instance, that nine specimens from Cyprus are decidedly *minimus*, several examples from S. Italy (Calabria, Sicily) are, without exception, *minimus*; but in middle and northern Italy we begin to meet with *hipposiderus*, about 15 per cent. of the individuals belonging to this form, as against 85 per cent. of *minimus*; still farther north, as you say, we find *hipposiderus*. . . . I hope I shall get so much spare time that I can work out the range of these forms in Italy on the basis of the collections preserved in all, or most, of the Italian Museums.”

certain distance southward into the area in which *minimus* is the dominant form. But all this is precisely what we must expect, in view of the fact that these races do not occupy isolated (insular) localities, but the central and southern part of one continuous land area.—Very likely there is also in W. Asia a certain region in which both forms or intermediate examples occur (see the female from S. Caucasus, which I have referred to *hipposiderus*, but which has the minimum size of this race).

From France and the whole of the Balkan Peninsula S. of Rustshuk we completely lack information; it would be particularly interesting to know whether French specimens are *hipposiderus* or *minimus*, or, possibly, identical with the British form, *minutus*.

I should not have taken the trouble to give the proofs—once more, and in a much more detailed form—of the existence in continental Europe of two well-marked races of the Lesser Horseshoe Bat were it not for the following reason:—It is a matter of course that on the basis of the collection in one single Museum—be such collection even so rich as that of the British Museum—it is impossible to give more than a rough sketch of the range of these two races of *Rh. hipposiderus*; the working out of the details must be left to the local naturalists interested in the subject. But the stimulus to do such useful work is naturally taken away, or greatly weakened, when a writer, claiming to base his conclusion on a careful examination of an unusually large series of specimens, declares that he cannot see that the supposed racial difference is anything but a difference between male and female of the same species. To show that this opinion is entirely wrong is the object of these lines. Naturalists may safely take it as an established fact that these two races do exist; what we want to know now is, (1) the exact area occupied *exclusively* by the one or the other form, and (2) the area where both of them *occur together*. This latter is the transitional zone between the regions inhabited by the two races.

L.—*Some new European Insectivora and Carnivora.*

By GERRIT S. MILLER.

IN the course of some studies of the European mammal fauna, undertaken at the invitation of Mr. Oldfield Thomas, I have found the following hitherto unnamed Insectivora and Carnivora.

Crocidura russula cintræ, subsp. n.

Type.—Adult male (skin and skull). B.M. no. 98. 2. 2. 11. Collected at Cintra, near Lisbon, Portugal, January 26, 1896, by Oldfield Thomas. Original number 47.

Diagnosis.—Smaller than true *Crocidura russula* (hind foot 11·4–12·2 mm. instead of 11·7–14; condylo-basal length of skull 17·8–19·2 instead of 18–20·4); colour dark and rich, in striking contrast with the pallid tints of the Spanish *C. r. pulchra*, Cabrera, and with a strong coppery lustre rarely indicated in the typical race.

Colour.—Type: upperparts between the mars-brown and russet of Ridgway, very faintly darker along middle of back, the hairs everywhere with metallic coppery and silvery reflections. Underparts and feet pale wood-brown. Tail a dull indefinite broccoli-brown, darker above than below.

Skull and teeth.—Except for their smaller size the skull and teeth resemble those of true *russula*.

Measurements.—Type: head and body 64 mm.; tail 33; hind foot 11·4; ear 8·6; skull, condylo-basal length 18; width of brain-case 9; depth of brain-case 4·8; mandible (including incisors) 11·8; upper tooth-row 8·6.

Specimens examined.—Eleven, all from the type locality.

Remarks.—In its small size the Cintra shrew agrees with the Spanish race, but the colour is conspicuously darker. The skins show no specially noteworthy variations, though in a few individuals the fur is less glossy than usual. Taken as a whole the series is about as dark as in French and Belgian *russula*; but the peculiar coppery lustre is highly characteristic of the Portuguese form.

Crocidura cyrnensis, sp. n.

Type.—Adult male (in alcohol). B.M. no. 6. 3. 14. 1. Bastia, Corsica. Collected and presented by E. R. Southwell, Esq.

Diagnosis.—Smaller than the Sicilian *Crocidura caudata* (hind foot 12–12·4 mm. instead of 14 mm.); tail relatively about as long as in *caudata*, but not unusually thickened (its ratio to head and body about 70, its diameter at middle 2 mm. instead of 3 mm.).

Colour.—Upperparts broccoli-brown slightly washed with sepia, the slate-grey bases of the hairs showing through at surface and producing a general effect nearly the drab of Ridgway. Most of the hairs with faint silvery reflections in certain lights. Underparts and feet light smoke-grey.

Skull and teeth.—No perfect skull has been seen, but there are apparently no special cranial peculiarities. Teeth essentially as in *C. russula*.

Measurements.—Type: head and body 67 mm.; tail 48; hind foot 12.4; ear 10; skull, from front of incisor to back of glenoid fossa 11.6; mandible (including incisor) 11.6; upper tooth-row 8.

Specimens examined.—Two, the type, and a skin from La Foce de Vizzavora, presented by Col. J. W. Yerbury.

Crocidura balearica, sp. n.

1901. *Crocidura russula*, Thomas, Proc. Zool. Soc. London, i. p. 39.

Type.—Adult female (skin and skull). B.M. no. 0. 7. 1. 42. Collected at San Cristobal, Minorca, Balearic Islands, April 7, 1900, by Oldfield Thomas and R. I. Pocock. Original number 263.

Diagnosis.—Similar to *Crocidura cyrnensis*, but teeth much smaller.

Colour.—Type: above hair-brown tinged with sepia, the hairs nearly without metallic reflections; below dull smoke-grey. Feet and tail a dull, indefinite brownish, the tail scarcely lighter below.

Skull and teeth.—Except for the smaller teeth there appear to be no cranial or dental peculiarities to distinguish the species from *C. cyrnensis*.

Measurements.—Type: head and body 42 mm.; tail 45; hind foot 12.5; ear 9; distance from front of upper incisor to back of second molar 7.4.

Specimens examined.—Three, all from the type locality.

Remarks.—This species, *C. cyrnensis*, *C. caudata*, and *C. cypricæ* (Bate) form a group, of which no continental member is yet known, characterized, as compared with *C. russula*, *C. leucodon*, and *C. mimula*, by the noticeable elongation of the tail.

Vulpes ichnusæ, sp. n.

Type.—Adult male (skin and skull). B.M. no. 88. 12. 1. 2. Collected at Sarrabus, Sardinia, February 26, 1885, by G. B. Travers, and presented by the Marquis G. Doria.

Diagnosis.—Size less than in any of the known continental members of the *Vulpes vulpes* group; both hind foot and condylo-basal length of skull less than 130 mm. in adult male, ear from crown only 60–70 mm., colour rather dark.

Colour.—Face and head dark rufous, becoming lighter and more dull on base of ears and on neck, and fading to

ochraceous-rufous on shoulders and back. Sides of neck, outer surface of upper arm, and region just behind axillæ a tawny buff. Underfur of back drab-grey at base, tawny clay-colour at tip. Longer hairs of head, sides, and back (behind shoulders) much speckled by the presence of a buffy white subterminal area (about 5 mm. long) on each hair; extreme tips reddish. Feet and legs ochraceous-rufous, slightly clouded with blackish and a little speckled with buffy white. Tail like back at base, the ochraceous-rufous gradually fading through a buffy grey to the whitish buff tip, the longer hairs everywhere except at tip with 30-40 mm. black terminal area. Underparts in front of fore legs buffy white tinged with hair-brown, the latter becoming nearly clear on middle of throat. Rest of underparts a mixture of hair-brown and dull tawny, the latter predominating laterally.

Skull and teeth.—Except for their smaller size the skull and teeth are essentially as in *Vulpes vulpes*.

Measurements.—Type: hind foot 123 mm.; ear from crown 70; skull, condylo-basal length 129; zygomatic breadth 78; mastoid breadth 47; rostral breadth over canines 22; depth of brain-case 41; frontal depth at last molar 33; rostral depth behind canine 17; mandible 100·4; maxillary tooth-row 59; mandibular tooth-row 65·4.

Specimens examined.—Two, both from Sardinia.

Remarks.—While the Sardinian fox is readily distinguishable from its continental allies by its small size, it closely agrees in this respect with the small fox of Crete. It retains, however, the usual dark, bright coloration of the ordinary European animals, while in the Cretan fox the rufous parts are faded to ochraceous buff.

Vulpes indutus, sp. n.

1904. *Vulpes vulpes*, Bate, Proc. Zool. Soc. London, 1903, ii, p. 345 (April 1, 1904).

Type.—Adult (skin only). B.M. no. 3. 12. 4. 25. Cape Pyla, Cyprus (*Miss D. M. A. Bate*).

Diagnosis.—Similar to the small *Vulpes ichnusæ* of Sardinia, but general colour paler (face ochraceous-buff instead of dark rufous, sides dull yellowish buff instead of tawny buff) and legs grizzled blackish in strong contrast with colour of sides.

Colour.—Face and head ochraceous-buff, becoming lighter and more buffy on base of ears and fading to dull yellowish buff on neck and body. Underfur of back a slaty grey at base, becoming nearly russet at tips of hairs, this darker

colour appearing at surface from between ears to base of tail and over thighs and shoulders. Longer hairs of head, sides, and back with broad subterminal light area, buffy on neck and back, dull whitish on flanks and sides, the extreme tips blackish. Legs a grizzle of blackish and whitish in strong contrast with colour of sides, the inner surface washed with dull ochraceous. Feet blackish, the hind foot much suffused with dull ochraceous. Tail buffy clay-colour, the tip nearly white, most of the hairs, except at tip, black terminally, and those of underside with a whitish subterminal area. Underparts to fore legs buffy white, clouded by the dark underfur and becoming buff on inter-ramia and dusky on tips. Behind fore legs the clouded whitish extends as a narrow median area between the clear dull buff of lateral portions of underparts.

Skull and teeth.—The skull is conspicuously smaller than that of *Vulpes vulpes*, in this respect agreeing with that of *V. ichnusa*. It resembles the latter also in its greater relative breadth as compared with skulls of mainland foxes. The teeth show no special peculiarities.

Measurements.—Type: ear from crown 62 mm. (in two other specimens 65 and 68). Skull of adult (probably male), from type locality, No. 3. 12. 4. 26: condylo-basal length 123; zygomatic breadth 73.4; mastoid breadth 42.6; rostral breadth over canines 22.6; depth of brain-case 38; depth behind last molar 31.6; rostral depth behind canine 16.4; mandible 97; maxillary tooth-row exclusive of incisors 55.4; mandibular tooth-row exclusive of incisors 63.4.

Vulpes vulpes silaceus, subsp. n.

Type.—Adult male (skin and skull), collected near Silos, Province of Burgos, Spain, January 1907, by the Rev. Father Saturio Gonzalez. Original number 1.

Diagnosis.—Like *Vulpes vulpes vulpes* of Central Europe, but with the reddish tints mostly replaced by buffy and greyish.

Colour.—Head and face tawny-ochraceous, becoming a yellowish ochraceous-buff behind ears and brightening to a dull rufous about eye and between eye and base of whiskers; upper surface of muzzle ochraceous-buff; forehead from level of front of eyes, and cheeks behind eyes, strongly suffused with creamy white, this becoming less evident between ears and disappearing entirely on ochraceous-buff area behind ear; hairs of outer margin and inner surface of ear pale cream-buff, those of inner margin light buff; back of ear with the

usual blackish area; back a coarse mixture of black, creamy white, and russet, the black predominating along middle of neck and between shoulders, the russet along median line of back; on sides the black nearly disappears, and the russet changes to a light ochraceous-buff which becomes nearly clear (that is, scarcely overlaid with creamy white) around base of fore leg and on shoulder nearly to median line of back; legs a tawny ochraceous-buff noticeably darker than that of sides, the hairs on outer surface rather conspicuously black-tipped; feet somewhat yellower than legs, the upper surface strongly washed with black; tail a light buffy grey, tinged with a tawny ochraceous-buff like that of legs above, whitish at extremity, the longer hairs everywhere (except at tip) with terminal 20-30 mm. black, the dark clouding thus produced most noticeable on lower surface; underparts dull whitish, everywhere clouded with slaty black, this most conspicuous on throat and along middle of chest.

Skull and teeth.—Essentially as in the fox of Central Europe.

Measurements.—Type: head and body 750 mm.; tail-vertebræ 370; hind foot 150; skull, condylo-basal length 143; zygomatic breadth 78; mastoid breadth 48.8; rostral breadth over canines 24; depth of brain-case 41; depth behind last molar 35.4; rostral depth behind canine 17.6; mandible 99; maxillary tooth-row, exclusive of incisors, 65; mandibular tooth-row, exclusive of incisors, 73.

Specimens examined.—Nine, from the following localities in Spain: *Province of Vitoria*, Arrechavaleta, 1; *Province of Burgos*, Silos, 1; Palacios, 1; vicinity of Burgos, 1; *Galicia*, Forreo del Allo, 1; *Province of Seville*, vicinity of Seville, 3; *Province of Alicante*, Elche, 1.

Meles arcalus, sp. n.

1899. *Meles meles mediterraneus*, Barrett-Hamilton, Ann. & Mag. Nat. Hist. (7) iv. p. 131 (November 1899) (part.).

1906. *Meles meles mediterraneus*, Bate, P. Z. S. 1905, ii. p. 318 (April 5, 1906).

Type.—Young female (skin and skull). B.M. no. 5.12.2.17. Collected on the Lassethie Plain, Crete, by Miss D. M. A. Bate. Original number 25.

Diagnosis.—Smaller and paler than in the ordinary European badgers (upper length of skull in adult less than 110 mm.; maxillary tooth-row, exclusive of incisors, about 35 mm.); auditory bullæ not flattened, their form as in the Caucasian *Meles minor* (Satunin).

Colour.—The colour so closely resembles that of the common badger as to need no detailed description. It is, however, somewhat paler than in true *Meles meles*, agreeing in this respect with the Spanish *M. m. mediterraneus*.

Skull.—In general form the skull appears to agree with that of *Meles meles* (no perfect adult skulls examined), though it is readily distinguishable by its smaller size (upper length in adult 107 instead of 124–137 mm.) and by the form of the audital bullæ. These are strongly inflated, the highest region near middle of bulla proper (exclusive of meatal tube) and so broadly rounded as to show no longitudinal ridge, the region between highest portion and meatus not noticeably concave. Their form resembles that in the much larger *Meles minor* (Satunin) as figured in the original description* and as represented by specimens collected by Mr. A. Robert in the neighbourhood of Trebizond.

Teeth.—The teeth are smaller than those of *Meles meles*, and the smaller cusps tend to be better developed, but otherwise they show no special peculiarities except that the postero-external border of the upper molar appears to be more strongly concave than usual in *M. meles*. The material at hand is, however, not sufficient to show whether this character is constant.

Measurements.—Type: hind foot 80 mm.; ear from crown 17 (both from dry skin): skull, condylo-basal length 100; upper length 105 (107) †; distance from anterior rim of orbit to gnathion 36 (38·6); zygomatic breadth 55·6; mastoid breadth 48·6; depth of brain-case at front of basi-occipital 36; mandible 68; maxillary tooth-row, exclusive of incisors, 36 (36·8); mandibular tooth-row, exclusive of incisors, 42·6; mandibular molars (crowns) 20·4.

Specimens examined.—Three, all from Crete.

Putorius erminea ricinæ, subsp. n.

1904. *Putorius erminea*, Barrett-Hamilton, Annals of Scottish Natural History, p. 203 (October 1904).

Type.—Adult male (skin and skull). B.M. no. 7. 10. 19. 1. Collected at Islay House, Island of Islay, Scotland, February 6, 1896, by P. Mackenzie. Presented by Hugh Morrison, Esq.

Diagnosis.—Size less than in *Putorius erminea stabilis* of Southern England (hind foot in adult females 35 to 40 mm.

* Mitteilungen des Kaukasischen Museums, ii. (1905), pl. i. 1906.

† Measurements in parentheses are those of an imperfect adult skull without exact locality.

instead of 38 to 44 mm.) ; skull with zygomatic arches very wide-spreading, the ratio of zygomatic breadth to condylo-basal length ranging from 58 to 60 instead of from 53 to 57.

Measurements.—Type: head and body 254 mm.; tail 105; hind foot 43; skull, condylo-basal length 47; zygomatic breadth 24·2; mastoid breadth 23·2; occipital depth to lip of foramen magnum 13; frontal depth behind tooth-row 13·2; mandible 26·8; maxillary tooth-row, exclusive of incisors, 12; mandibular tooth-row, exclusive of incisors, 15.

Specimens examined.—Seven from Islay and six from Jura, the latter kindly placed at my disposal by Mr. Harmer, of the Cambridge Museum.

Felis grampia, sp. n.

Type.—Young adult male (skin and skull). B.M. no. 4. 1. 25. 3. Invermoriston District, Inverness, Scotland, January 16, 1904. Presented by A. H. Cocks, Esq. Original number 60.

Diagnosis.—Similar to *Felis silvestris*, Schreber, but darker (the general effect of back and sides broccoli-brown instead of smoke-grey) and with black markings more extensive and better defined.

Colour.—Underfur of back and sides a light ochraceous-buff, the basal half of the hairs mouse-grey. Light annulations of longer hairs very nearly the cream-buff of Ridgway. Black tips to longer hairs more noticeable than in *Felis silvestris*, and general effect of ground-colour distinctly browner and with no trace of the frosted appearance often very noticeable in the continental animal. Upperside of feet and inner surface of hind legs ochraceous-buff, becoming duller and somewhat drab-tinged on underside of body. Pectoral and intercrural white areas well defined and strongly contrasted with surrounding colour. Black spotting on middle of chest conspicuous. Soles and palms blackish. Dark markings on tail, legs, and upperparts similar to those of *Felis silvestris* in arrangement, but more definite in outline, particularly the transverse stripes on outer side of fore legs and those on posterior half of body, the latter nearly always appearing as definite stripes.

Skull and teeth.—As in *Felis silvestris*.

Measurements.—Type: head and body 534 mm.; tail 338; hind foot 127; skull, condylo-basal length 87; zygomatic breadth 66; mastoid breadth 43·8; postorbital constriction 34·6; interorbital constriction 18·6; breadth of rostrum over

canines 25; depth of brain-case 37; frontal depth behind tooth-row 31·4; rostral depth behind canine 16; mandible 63; maxillary tooth-row, exclusive of incisors, 29·6; mandibular tooth-row, exclusive of incisors, 32·4.

Specimens examined.—Eleven, all from Scotland.

Felis tartessia, sp. n.

Type.—Adult male (skin and skull). B.M. no. 7. 6. 4. 1. Coto Doñana, near Jerez de la Frontera, Spain. Collected and presented by B. F. Buck, Esq.

Diagnosis.—Larger and darker than *Felis silvestris* and with conspicuously larger teeth.

Colour.—The colour is noticeably darker than in *Felis silvestris*, scarcely or not distinguishable from that of *F. grampius*. Underfur more slaty at base than in the two related species, about the grey No. 6 of Ridgway, its terminal portion a dull cream-buff. Pale annulations of longer hairs nearly as light as in *F. silvestris*. Inner surface of hind legs a light ochraceous-buff; rest of underparts as in *F. grampius*. Dark markings well defined, their arrangement and extent as in the British Wild-cat.

Skull.—In fully adult males the skull is very large, apparently exceeding that of any of the other members of the group. The form is not peculiar.

Teeth.—While in form the teeth show no peculiarities their size immediately distinguishes them from those of other members of the group, including the domestic cat. This is particularly noticeable in the premolars both above and below. In the three skulls examined (two males and one female) the length of the posterior two upper premolars together is 19·8 mm., while in fifteen skulls of *F. silvestris* and *F. grampius* it ranges from 16·6 to 18·8. The combined length of the three lower cheek-teeth in the three Spanish cats ranges from 23·4 to 23·6, while in the fifteen northern specimens the extremes are 18·8 and 21·2.

Measurements.—The specimens were not measured in the flesh, but the hind foot and tail both appear to be longer than in the northern forms. Skull of type: condylo-basal length 93 ± mm.; zygomatic breadth 76·4; mastoid breadth 47·2; postorbital constriction 33; interorbital constriction 21·6; breadth of rostrum over canines 29; frontal depth behind tooth-row 33; rostral depth behind canine 20·4; mandible 69; maxillary tooth-row, exclusive of incisors, 33; mandibular tooth-row, exclusive of incisors, 35·4.

Specimens examined.—Three, the type and two others (probably from the type locality).

Lynx pardella, nom. nov.

1824. *Felis pardina*, Temminck, Monogr. de Mamm. i. p. 116. Not
Lynx pardina, Oken, 1816.

Type.—Adult female (skin and skull). B.M. no. 4. 12. 12. 2. Coto Doñana, near Jerez de la Frontera, Spain. Collected and presented by Abel Chapman, Esq.

In applying the well-known name *Lynx pardina* to the Spanish lynx the fact has been overlooked that Temminck took his specific name from Oken, or at least that he supposed his animal to be the same as that of the earlier author. Oken's *Lynx pardina* was a striped cat from "Turkey and Barbary"*, so that, whatever the true identity of the species, it cannot have been the spotted lynx of Spain.

The material in the British Museum shows that two colour-patterns occur among Spanish lynxes, in one of which, apparently the more usual, the spots on the back and sides are small, mostly about 10 mm. or less in diameter, the rows indistinct, but containing evidently more than 25 spots between shoulder and base of tail; while in the other the spots are larger and more distinct, many of them 20 mm. in diameter, the rows containing only about a dozen spots between shoulder and base of tail. From the skins at hand it is impossible to determine the status of these two forms, though the similarity of their skulls indicates that they are merely colour-phases of a single species. To avoid any possible ambiguity I have designated a type specimen for this new name, and have selected for this purpose a skin showing the better-known, small-spotted type of coloration. Temminck's animal came from the neighbourhood of Lisbon, Portugal, but to which of the two phases it belonged the description gives no clue.

LI.—Two new Forms of the Spanish Hare.

By GERRIT S. MILLER.

THE series of fifteen specimens of the Spanish Hare in the British Museum shows that this strikingly characterized species † is represented by three readily distinguishable forms, which may be briefly defined as follows:—

* "In der Türkei und Barbarei . . . rothbraun, Bauch falb, Gurgel weiss, überall voll schwarzer Streifen oben, Flecken unten, auf Ohren solche Querstreifen." (Oken, Lehrbuch der Zoologie, iii. Th. ii. Abth., p. 1051.)

† For a full discussion of the status of the Spanish Hare, see de Winton, Ann. & Mag. Nat. Hist. ser. 7, i. p. 153 (February 1898). The name

Lepus granatensis granatensis, Rosenhauer.

Type locality.—Vicinity of Granada, Spain.

Geographical distribution.—The greater part of Spain, extending at least from the Province of Burgos in the north to the entire Mediterranean coast; Balearic Islands. Exact limits of range not known.

Diagnosis.—Ear long, its height from crown in dried specimens 105–115 mm.; general coloration pallid, the ground-colour of back nearly the cream-colour of Ridgway and much in excess of black.

Colour.—Underfur (17 mm.) bluish grey at base, the hairs becoming buffy terminally, their extreme tips frequently darker, though never definitely blackish; longer hairs (30 mm.) greyish at base, then black to tip, each with a conspicuous, sharply defined, subterminal annulation (4 mm.) of pale cream-buff; clear area along sides (ill defined) between cinnamon-rufous and ochraceous-rufous, becoming somewhat less bright on inguinal patches and darker and more intense on outer surface of thighs; outer surface of fore leg a duller shade of the same colour, the inner surface white to wrist, where the white crosses to outer side and forms a conspicuous patch on metacarpals. Collar pale wood-brown, strongly washed with pale, dull, ochraceous-buff. Chin slightly clouded with dark brown.

Skull and teeth.—In the typical form of *Lepus granatensis* the skull is of maximum size for the species, the occipito-nasal length in full-grown individuals ranging about from 85 to 90 mm.

Measurements.—Adult from Granada: hind foot 115 mm.; ear from crown 120. Adult from Seville (type of *Lilfordi*): hind foot 116; ear from crown 120. Adult male from Silos, Province of Burgos (no. 7384 G. S. M.): head and body 520; tail-vertebræ 87; hind foot 115; ear from crown 120*. Skull of adult male from Seville (type of *Lilfordi*) and of adult male from Silos, Province of Burgos (no. 7384 G. S. M.), those of latter in parentheses: occipito-nasal length 88·6 (88); condylo-basal length 77·6 (78); zygomatic breadth 42·8 (42); interorbital breadth 19 (18·8); postorbital breadth 12·4 (13·4); breadth of brain-case 31·8 (29·6); nasal (diagonal) 37·4 (39·6); greatest breadth of both nasals together 20 (18·8); diastema

Lepus Lilfordi applied to the animal by Mr. de Winton has been shown by Hiltzheimer (Zool. Anzeiger, xxx. p. 512, August 14, 1904) to be antedated by the *Lepus granatensis* of Rosenhauer ('Die Thiere Andalusiens,' p. 3, 1856).

* In the flesh the hind foot and ear of this specimen measured 118 and 140 mm. respectively.

24.4 (25.6); mandible 67 (65.6); maxillary tooth-row (alveoli) 16.2 (15); mandibular tooth-row (alveoli) 17.6 (15.8).

Specimens examined.—Twelve, from the following localities:—Silos, Province of Burgos, 2; Castrillo de la Reina, Province of Burgos, 2; Seville, 4; Las Marismas, Province of Seville, 1; Granada, 1; Selva, Majorca, Balearic Islands, 1; no exact locality, 1.

Remarks.—The typical form of the Spanish hare is at once recognizable by its long ears and pallid coloration. The specimen from Majorca appears to belong to this subspecies, though its hind foot and ear are both rather shorter than usual (108 mm.). It is in a bleached abraded pelage that evidently gives no idea of the animal's normal appearance, though its colour is matched by that of a skin in similar condition from Seville.

Lepus granatensis galliccius, subsp. n.

Type.—Adult male (skin and skull). B.M. no. 94.2.16.1. Collected at La Coruña, Province of Coruña, Spain, January 28, 1894, by Dr. V. L. Seoane.

Geographical distribution.—At present this form is known from the extreme north-west corner of Spain only.

Diagnosis.—Similar to *Lepus granatensis granatensis*, but colour throughout dark and rich, the ground-colour of back nearly the ochraceous-buff of Ridgway, and scarcely in excess of black; white markings on fore leg not so extensive as in the typical form.

Colour.—Underfur with buffy portion distinctly brighter than in *Lepus granatensis granatensis*, and extreme tips of the hairs becoming definitely black. Subterminal annulations of longer hairs light ochreous-buff. Clear area along sides dull cinnamon-rufous, the inguinal patches similar, but outer surface of thigh and of front leg distinctly darker and brighter. Inner surface of front leg with white either extending to wrist or not beyond elbow, the usual white patch on metacarpals present in either case, though slightly less extensive than in *L. granatensis granatensis*. Collar a dark wood-brown washed with yellowish clay-colour. Head and ears noticeably darker than in the typical form, the eye-ring thrown into rather strong relief. A conspicuous, dull, cinnamon-rufous patch at base of whiskers. Chin heavily clouded with dusky, in strong contrast with surrounding parts.

Skull and teeth.—As in *Lepus granatensis granatensis*.

Measurements.—Type: hind foot 107 mm.; ear from crown 105. A second specimen (no. 82.12.8.1), Vigo,

Province of Pontevedra, measures : hind foot 110 ; ear from crown 105.

Specimens examined.—Two, both from North-western Spain.

Lepus granatensis iturissius, subsp. n.

Type.—Adult (skin and skull). B.M. no. 97. 6. 15. 1. Collected in the Basses Pyrénées by G. Greig *. Presented by J. E. Harting.

Geographical distribution.—Basses Pyrénées. Limits of range unknown.

Diagnosis.—Colour essentially as in *Lepus granatensis granatensis*; ear short, its length from crown only 95 mm.; skull small and slender, its occipito-nasal length about 82 mm. instead of 85–90 mm.

Colour.—The colour so exactly agrees with that of *Lepus granatensis granatensis* as to require no special description.

Skull and teeth.—The skull differs from that of *Lepus granatensis granatensis* in its distinctly smaller size, in the even less convex dorsal profile, and the more slender rostrum. The rostral depth at front of tooth-row is 17 mm., while in *L. granatensis granatensis* it ranges from 19 to 21 mm. Other cranial characters as well as teeth as in the typical form.

Measurements.—Hind foot 110 mm.; ear from crown 95. Skull : occipito-nasal length 82·4 ; condylo-basal length 72·6 ; zygomatic breadth 39·4 ; interorbital breadth 16 ; postorbital breadth 13 ; breadth of brain-case 29·8 ; nasal (diagonal) 36·4 ; greatest breadth of both nasals together 18·8 ; diastema 22·6 ; mandible 61 ; maxillary tooth-row (alveoli) 14·8 ; mandibular tooth-row (alveoli) 15·8.

Specimen examined.—The type.

Remarks.—This strikingly marked form, which may prove to be specifically distinct from *Lepus granatensis*, is immediately recognizable by its short ear and small slender skull. Its range is probably confined to the region of the Basses Pyrénées ; at least, the Central Pyrenean hare, as described by Hilzheimer †, is a very different animal, a large member of the *Lepus europeus* group.

* Probably bought in market at Biarritz (see note by Mr. Greig in 'Field,' no. 2301, p. 135, January 30, 1897).

† *Lepus europeus pyrenaicus*, Hilzheimer, Zool. Anzeiger, xxx. p. 512 (August 14, 1906). Type locality : "Bagnères."

LII.—*Description of Two new Characinid Fishes from South America.* By C. TATE REGAN, M.A.

MIMAGONIATES, gen. nov.

Body moderately elongate, compressed; abdomen keeled, but not strongly compressed to an edge. Mouth small; teeth tricuspid, in a single series; no maxillary teeth; palate toothless. Nostrils close together. Gill-membranes not united, free from the isthmus. Scales cycloid, of moderate size; lateral line incomplete. Dorsal fin short, posterior in position; adipose fin present; anal fin elongate.

Intermediate between *Chirodon*, Girard, and *Leptagoniates*, Blgr.

Mimagoniates Barberi, sp. n.

Depth of body 3 to $3\frac{2}{3}$ in the length, length of head 4 to $4\frac{2}{3}$. Snout much shorter than eye, the diameter of which is $2\frac{1}{2}$ to $2\frac{3}{4}$ in the length of head and a little less than the inter-orbital width. Cleft of mouth nearly vertical; maxillary not extending to below the eye. 42 to 45 scales in a longitudinal series; lateral line on 4 to 8 scales only. Dorsal 10; origin equidistant from gill-opening and base of caudal, above the anterior part of the anal. Anal 34–38; origin equidistant from anterior part of eye and base of caudal; anterior rays the longest, about $\frac{3}{5}$ the length of head; free edge straight or slightly concave. Pectoral extending to or a little beyond the base of ventral. Caudal forked. A lateral band (blackish in preserved specimens) from the lower part of eye to the lower lobe of caudal. An oblique dark stripe on the dorsal; anal with a dark margin.

Hab. Arroyo Yâcá, Estación Caballero, Paraguay.

Several specimens, the largest 40 mm. in total length, collected by Dr. A. Barbero.

CTENOCHARAX*, gen. nov.

Body oblong, compressed; abdomen rounded. Mouth small; teeth slender, subconical, in a single series; maxillary toothed; palate toothless. Nostrils close together; gill-membranes not united, free from the isthmus. Scales cycloid, rather large; lateral line incomplete. Dorsal fin short, nearly entirely in advance of the rather short anal; no adipose fin.

Related to *Aphyocharax*, Gthr.

* The name *Ctenocharax* is given on account of the comb-like appearance of the single series of teeth in the jaws.

Ctenocharax bogotensis, sp. n.

Depth of body $2\frac{2}{3}$ in the length, length of head $3\frac{3}{4}$. Snout as long as eye, the diameter of which is $4\frac{1}{2}$ in the length of head and $1\frac{1}{2}$ in the interorbital width. Cleft of mouth oblique, the maxillary extending to below the anterior $\frac{1}{3}$ of eye. 33 scales in a longitudinal series; lateral line on 5 or 6 scales only. Dorsal 11, origin equidistant from eye and base of caudal. Anal 14, origin below the last ray of the dorsal; longest rays $\frac{1}{2}$ the length of head; free edge straight. Pectoral $\frac{3}{4}$ the length of head, not reaching the ventrals. Caudal notched, with rounded lobes. Coloration uniformly olivaceous (in spirit).

Hab. Bogota.

A single specimen, 63 mm. in total length, purchased in 1868.

LIII.—*Note on Raia undulata*, Lacep.

By C. TATE REGAN, M.A.

IN the British Museum is a specimen of *Raia undulata*, Lacep., from the coast of Cornwall, presented by the late Mr. Harcourt Powell in 1880. As this species is not usually regarded as belonging to the British fauna, I have tried to find further evidence of its occurrence on the Cornish coast, which is furnished by Couch, who, as has been pointed out by Moreau, certainly had an example of *Raia undulata*, which he regarded as a variety of *R. microcellata*, Montagu.

Raia undulata is described in detail by Moreau (Poiss. de France, i. p. 434, 1881), who states that it is found on all the coasts of France (Mediterranean, Atlantic, and Channel). It is not a little curious that the original describer, Lacepède (Hist. Nat. Poiss. iv. p. 675, 1802), wrote that it occurred "entre les rivages si fréquentés de la France et de l'Angleterre."

Of other British species *Raia clavata*, L., appears to be nearest to *R. undulata*, but the latter should generally be easily recognized by its system of coloration, which has been thus described by Couch (Fish. Brit. Islands, i. p. 108, 1862): "Another example differed considerably from the former [i. e. *Raia microcellata*] in the nature and distribution of its colours, which were still more beautiful. The ground-colour was a brilliant yellow, marked with numerous gyrations, which were lyre-shaped, each gyration being formed of a

dark line, margined on each side by a series of pale yellow spots, like beads."

According to Moreau, the pale spots bordering the dark undulated stripes may frequently be absent, or in large specimens they may be greyish white in colour and the stripes may be less distinctly marked than in the young.

LIV.—*On a new Hare from the Transvaal.*

By H. LYSTER JAMESON.

IN June of this year I noticed a large grey *Pronolagus* on the Observatory Kopje adjoining the town of Johannesburg. After some difficulty I succeeded in trapping this specimen, a full-grown and pregnant female, which proved to belong to a hitherto undescribed form. Pending a fuller study of the genus *Pronolagus* I shall describe this hare as a High-Veld race of *Pronolagus Ruddi* (Thomas and Schwann, Abstract P. Z. S. no. 18, p. 23, April 25, 1905; and P. Z. S. 1905, vol. i. p. 272).

The Witwatersrand *Pronolagus* is specially interesting because it extends considerably the range of the *P. Ruddi* group westwards, hitherto known only from Zululand and the Eastern Transvaal.

This form differs from the type species (so far as I can gather by comparing it with Thomas's description, for I have not had an opportunity of comparing it with the type) in its generally grey colour, in the dark tail, black for its distal third, in the absence of slaty bases to the fur, and in having black soles to its feet.

*Pronolagus Ruddi randensis**, subsp. n.

Size as in *P. Ruddi* (much larger than in *P. crassicaudatus*). *Coat* harsh, as in *P. Ruddi*. *Ground-colour* buff, heavily pencilled with black, giving the impression of rather dark grey when seen at a distance. *Colour* a little lighter on rump. The long stiff hairs are black, with a subterminal buff zone, as in *P. Ruddi*, and are about 18 mm. long. Among these, especially along the back, are a few very long hairs (40 mm. or more), which are white at the base and black distally, sometimes with a subterminal white

* Subspecific name from *Rand*, popular abbreviation for *Witwatersrand*, the name of the range of hills on which Johannesburg is situated.

ring. These hairs give the middle part of the back a particularly dark grey appearance. Wool-hairs buff, without the slaty-grey bases characteristic of *P. Ruddi*.

Under surface buff, passing into grey on the flanks, so that there is no sharp line between back and belly. This gradation is due to the amount of black in the long coarse hairs becoming less towards the ventral surface, until, in the mid-ventral region, these hairs are entirely buff-coloured.

Head bluish grey, with a slight rufous tinge on the forehead. Nape-patch small and inconspicuous, rather more rufous than back. Throat and chest as back. Ears grey, as in *P. Ruddi*, but without the black edge. Limbs buffy rufous, not any lighter towards digits. Soles black.

Tail very large and bushy, about 140 mm. long, including the hairs; dark reddish brown, pencilled with black, at base; distal third of tail black.

Skull as in *P. Ruddi*, but slightly larger and rather narrower in the nasal region. The palatal foramina are not quite so much narrowed posteriorly, their inwardly directed edges, so conspicuous in *P. Ruddi*, being reduced to mere narrowed ridges of bone, so that the walls of the nasal chamber are exposed, as in *P. crassicaudatus*. The notch in the incisors is more distinct than in Thomas's figure of the skull of *P. Ruddi* (P. Z. S. 1905, i. pl. xvi. fig. 4). The upper molars have the uncrenulated anterior enamel-wall of the posterior lamina extending considerably less than halfway across the tooth, thus presenting conditions intermediate between *P. Ruddi* and *P. crassicaudatus*. The anterior lower premolars also show an intermediate condition, their anterior walls having a single notch on the left side and a double one on the right.

Dimensions of the type (measured in the flesh):—

Head and body 480 mm.; tail 110; hind foot 100; ear 97; ear-opening 87.

Skull dimensions: greatest length 94; basilar length 74; zygomatic breadth 41; nasals 47×20 ; interorbital breadth 18, intertemporal breadth 15; palatal foramina 29×8.5 ; palatal bridge 10; diastema 32.5; greatest breadth of nasal region, at level of anterior upper premolar, 23. For measurements of *P. Ruddi* see Thomas and Schwann (*loc. cit.*); for dimensions of two races of *P. crassicaudatus* see Thomas, Ann. & Mag. Nat. Hist. (7) vol. x. pp. 244–246 (1902).

Hab. Witwatersrand Range, Transvaal.

Type. Female. No. 108 in my collection. Observatory, Johannesburg, 5900 ft., 25th June, 1907.

In *habits* this hare resembles *P. crassicaudatus* and *P. Ruddi*.

It frequents the stony kopjes of the Witwatersrand, spending the day in holes under rocks and boulders, and coming out to feed at dusk. I have only once found it lying out in the daytime.

Like other *Pronolagi*, it frequently returns to the same spot to defæcate; hence its presence in a locality can often be detected by the piles of droppings on the hill-sides. It is a very retiring species, and seems little known among local sportsmen, although it occurs right up to the outskirts of Johannesburg.

Its short ears, heavy build, and general pose at once recall the European rabbit. It is very fleet on foot; in fact, the "red hare" (a collective name for the members of the genus *Pronolagus*) is regarded by sportsmen as the fastest of the South-African hares.

The uterus of the type specimen contained a single large leveret.

University College, Johannesburg,
September 1907.

LV.—On a new Dormouse from Asia Minor, with Remarks on the Subgenus "*Dryomys*." By OLDFIELD THOMAS.

IN 1906* I formed a special subgenus to contain the dormouse previously known as *Eliomys nitedula*, Pallas (syn. *E. dryas*, Schr.), and gave it the name of *Dryomys*; but I now find that this name is preoccupied †, and would propose to replace it by *Dyromys*, an anagram of the same word.

Since I formed the subgenus there has been discovered the large but nearly related Central-Asian species to which I applied the specific name *angelus*, and Mr. Gerrit Miller has drawn my attention to additional points of distinction between

* P. Z. S. 1906, ii. p. 348.

† "*Dryomys parvulus*, Tschudi, Fauna Peruana, p. 179, lam. xiii. fig. 1." Philippi, An. Mus. Chile, Murideos de Chile, p. 20 (1900).

Although this is, no doubt, merely an erroneous rendering of *Dryomys*, yet, as it occurs with a specific name attached and a reference both to a description and figure, it seems to be technically too valid as a name to be used again for another animal.

Another of my generic names, *Neotomys*, was used as a misprint for *Nectomys* by Wallace some years before I published it, but there the misprinted term was without any mention of a species or reference to a description, and consequently, viewed simply by itself, was a mere *nomen nudum*, which was not the case with Philippi's *Dryomys*.

this group and *Eliomys*; I am therefore, at his instance, prepared to give it full generic rank.

The new form may be called

Dyromys nitedula phrygius, subsp. n.

Size about as in subsp. *pictus*, therefore rather larger than in European *nitedula*. General colour above a light buffy yellowish, markedly lighter and more yellowish than in either typical *nitedula* of Southern Russia, *Wingei* of Greece, or the Persian *pictus*. Tail lined grey, with a faint tinge of buffy. Bullæ larger than in the European forms.

Dimensions of the type (measured in flesh):—

Head and body 100 mm.; tail 85; hind foot 21; ear 14.

Skull: greatest length 26·7; basilar length 20·4; greatest breadth 15; nasals 8; length of upper molar series 3·6.

Hab. Murad Dagh, Ushak Province, Asia Minor (Mount Dindymus, Phrygia, of classical maps). Altitude 7500'.

Type. Adult male. B.M. no. 5. 10. 6. 1. Original number 37. Collected and presented by W. Griffiths Blackler, Esq. Two specimens.

This pretty dormouse may be distinguished from the other forms of *D. nitedula* by its brighter and yellower colour. The Museum has recently received from Mr. Herbert Sykes a specimen nearly topotypical of Blanford's *Myoxus pictus* from Central Persia, which might have been the same as the Asia Minor animal, but proves to be a comparatively greyer and less yellowish form. Specimens quite similar to the latter have also been obtained in the Kurrum Valley, N.W. Frontier of India, by Mr. C. H. T. Whitehead, thus forming a considerable extension of the eastward range of this type of dormouse.

LVI.—Notes on an "Octopus" with Branching Arms.

By EDGAR A. SMITH, I.S.O., F.Z.S.

[Plate XVIII.]

A COLLECTION sent home this year by Mr. R. Gordon Smith from Japan contained a very remarkable specimen of an *Octopus* with branching arms. It has been presented by him to the British Museum.

Furcation in the arms of Cephalopods appears to be of

rare occurrence, judging from the few records of such abnormalities. C. Parona* has described and figured bifurcation in an arm of "*Eledone moschata*," an additional arm in *E. Aldrovandi*, and a bifurcate arm in "*Octopus vulgaris*." These are the only records I have been able to discover of such irregularities of growth.

The present specimen presents a most remarkable instance of arm-branching, the furcation not being confined to one arm, but five out of the eight arms branch more than once. Unfortunately the specimen, although sent home in formalin, had evidently been dried previously, and all the viscera and part of the head had been cut away, leaving only the body-sac, the dorsal skin of the head, and the arms.

The latter are connected at the base by a rather broad membrane, broadest between the ventral pair and the lower laterals, rather narrower between the two laterals, and quite narrow between the upper laterals and the dorsal arms and between the latter also. The membrane between the two ventrals has been removed, so it is impossible to say anything definite regarding its extent. I think, however, we may regard it as fairly certain that it was as wide at this part as anywhere.

Arms.—The proportional length of the arms in such an abnormal specimen is not of much importance. They are rather equal in thickness, excepting the dorsal pair, which are a trifle more slender than the rest.

The *right dorsal* is the only arm that does not exhibit furcation.

The *left dorsal* has two branchings, the first at about 6 inches from the mouth and the second an inch higher up on the other side of the arm. This, again, trifurcates at the end.

The *left upper lateral* is normal for about 18 inches from the oral centre, then bifurcates, the right branch again bifurcating at a distance of 2 inches further up.

The *right upper lateral* is regular for 13 inches and then bifurcates, the branch being a mere stump half an inch in length and looking as if the rest of it had been bitten off. An inch and a half further up the arm a second furcation occurs, and $2\frac{1}{2}$ inches further the arm trifurcates, one of the branches, like that lower down, being only a stump an inch long and without any suckers. One of the longer branches trifurcates at the tip.

* Boll. Mus. Zool. Anat. Comp. Genova, 1900, no. 96.

The *left lower lateral* arm is normal for 20 inches from the mouth, then bifurcates.

The *right lower lateral* is regular for about 11 inches, then bifurcates, the smaller branch again forking at a distance of about 3 inches.

The *left ventral* is normal for 12 inches, then trifurcates, one of the three branches being single to the end, the other two, about 3 inches further up, again bifurcating, with two of the small branches again bifurcating; so that this arm has, in fact, nine branches altogether.

The *right ventral* is simple for about 15 inches, then divides, one branch being single to the end, the other bifurcating 2 inches further up.

Altogether, then, it is seen that this remarkable animal exhibits thirty-three branches to the eight normal arms, mostly towards their ends. They are, with the exception of the two stumps on the right upper lateral arm, provided with suckers alternating in two rows, those on some of the most slender branches being, in their dried and shrivelled condition, rather obscure. The largest suckers are on the lateral arms and are about 13 mm. in diameter.

The skin of the back, head, and the back of the arms, excepting the ventral pair, are of a dirty purplish colour, closely spotted with a darker tint and quite smooth. The web between the arms is also spotted, excepting the portion between the ventral pair and between the ventrals and lower laterals. The spotting does not extend far up the arms, which exteriorly are of a dark dirty purplish colour. The eyes are about $1\frac{3}{4}$ inches apart, with a small cirrus behind each and a still smaller one in front of them. Behind each eye, at a distance of about 15 mm., is a round pore-like circle $1\frac{1}{2}$ mm. in diameter. The ventral side of the body is pale, excepting towards the sides, where the darker colour of the back commences.

Dimensions.

| | in. |
|--|-----------------|
| Length of body from posterior end to between the eyes.. | $7\frac{3}{4}$ |
| Length of arms, from the mouth to the end of the longest branch of each :— | |
| Dorsal pair | $22\frac{1}{2}$ |
| Right upper lateral | 25 |
| Left " " | 26 |
| Right lower " | 20 |
| Left " " | 25 |
| " ventral | 18 |
| Right " | 19 |

The species appears to be the *Polypus cephea* (Gray) * described from a single animal in the British Museum. Although no special mention is made by Gray of the small cirri in front of the eyes, they really exist in his specimen, and the round pore-like circle behind each eye is also traceable. Gray did not give the colour of his species, but it is spotted just in the same way as the specimen now described.

Upon the cause of the peculiar abnormality of this animal I cannot venture an opinion. That it is an aberration from a normal type is, I think, very evident, for were it not so we should expect to find some regularity in the forking of the arms. Such, however, is not the case, as neither the dorsal pair, the laterals, or the ventrals exhibit any similarity.

With regard to the use of the generic name *Polypus* of Schneider, Dr. Hoyle † has shown that it must take the place of the commonly accepted *Octopus*, but his supposition that it had been overlooked by modern writers is not quite the case, for Jeffreys ‡, in describing *Octopus*, observes that it is "the genus *Polypus* of Schneider, but Leach seems to be the only modern naturalist who has adopted that name." This paragraph seems to have escaped Dr. Hoyle's notice, for he remarks:—"Jeffreys' attribution of the genus *Loligo* to Schneider might seem to indicate that he was acquainted with it [Schneider's work], but on that hypothesis it is difficult to explain why he quotes *Sepiola* as of Leach and is quite silent as to the prior names for *Octopus* and *Eledone*." In justice to Jeffreys I may mention that he does *not* quote Leach as the author of *Sepiola*, but Rondelet. I may also refer to the fact that Owen § was acquainted with Schneider's work, and gave an outline of his classification, and, had the "law of priority" been observed at that time, doubtless he would have employed the name *Polypus*. Finally, I would point out that Philippi, in his 'Handbuch der Conchyliologie,' p. 93, published in 1853, has employed the genus *Polypus*, Schneider, sinking *Octopus* as a synonym.

* Cat. Cephalopoda Antepedia Brit. Mus. p. 15 (1849).

† Mem. Manchester Phil. Soc. vol. xlv. no. 9, pp. 1-7.

‡ Brit. Conch. vol. v. p. 143.

§ Trans. Zool. Soc. 1838, vol. ii. p. 125.

LVII.—*Rhynchotal Notes*.—XLIII. By W. L. DISTANT.

WITH one exception all the Cicadidæ described in this paper are from the continent of Australia. The materials from which these species were described are (1) from the Northern Territories of South Australia collected by Mr. W. Stalker and sent to the British Museum by Sir William Ingram and the Hon. John Forrest, and also from another locality in the same territory collected and sent to the Museum by Mr. H. J. Hillier; (2) a collection made in Queensland by Mr. F. P. Dodd; and (3) a number of specimens sent to me by Mr. W. W. Froggatt for identification, with the intimation that they were not included in the Monograph of Australian Cicadidæ written by Messrs. Goding and Froggatt. For some other specimens I have to thank Mr. H. Ashton, of Sydney.

Subfam. *CICADINÆ*.

Division THOPHARIA.

Thopha colorata, sp. n.

♂. Head and pronotum reddish ochraceous; apical and basal margins of front and a broad transverse fascia on vertex between the eyes black; pronotum with the margins a little paler than disk, small obscure black spots at the anterior and posterior margins of the central longitudinal impression; mesonotum black, two obconical spots at anterior margin only indicated by their pale margins, on each side of which are two large discal, angulated, reddish-ochraceous spots, the interior angles of which form the inner margins of the obconical spots; lateral margins of pronotum and mesonotum and basal cruciform elevation reddish ochraceous, the latter with a central longitudinal black spot; abdomen above black, the tympana reddish ochraceous, the apical segment (excluding centre) cretaceous white; head beneath black, anterior margins between face and eyes ochraceous, lateral margins of face narrowly and obscurely ochraceous; sternum greyishly pilose; legs reddish ochraceous, anterior coxæ streaked with black, intermediate and posterior coxæ more or less cretaceously pilose; opercula pale ochraceous; abdomen beneath piceous, with the posterior segmental margins testaceous, the anal plate and segment reddish ochraceous, basal and lateral margins of abdomen, and a large spot at base of tympana, cretaceously white; eyes sessile, the breadth

between their outer margins equalling the length between the anterior margin of the pronotum and the base of the cruciform elevation; tegmina and wings subhyaline, talc-like; tegmina with the base and about basal two thirds of venation ochraceous or reddish ochraceous, apical venation brownish ochraceous, costal and postcostal areas and base of posterior claval margin black; wings with the base, venation, and basal halves of margins to anal area ochraceous or reddish ochraceous, at apical margins the veins are darker in hue; face very globose, with a central impressed longitudinal line, on each side of which is a longitudinal series of obscure nodules, lateral areas transversely striate; rostrum reaching the posterior coxæ.

Long., excl. tegm., ♂ 35 mm.; exp. tegm. 98 mm.

Hab. N. T., S. Australia (*H. J. Hillier*, Brit. Mus.).

Division C I C A D A R I A.

Macrotristria Godingi, sp. n.

♀. Vertex ochraceous, anterior area of front and a fasciate line connecting it with base castaneous, irregular markings surrounding the ocelli, a curved fasciate line at inner margins of eyes, and the central posterior margin, black; pronotum ochraceous, the posterior and lateral margins a little paler in hue, two central, discal, contiguous lines (united posteriorly and amplified at anterior margin), the furrows, and an oblique and a curved spot on each side of the central lines, black; mesonotum ochraceous, with four obconical spots, the two central ones darker and smaller and meeting two curved angulated spots, which emerge from the ochraceous cruciform elevation, black, extreme lateral margins also black; abdomen above black, the margins of the abdominal segments on apical half more or less ochraceous; body beneath black; face castaneous, space between face and eyes ochraceous, inner margins of eyes, posteriorly connected with a short oblique fascia, black; coxæ and legs ochraceous, longitudinal streaks to coxæ and femora, and the tibiæ more or less, castaneous or piceous, anterior and intermediate tarsi black; tegmina hyaline, talc-like, the venation piceous, extreme base, costal area, upper part of costal cell, and the claval veins ochraceous, postcostal area, and basal half of posterior claval margin, black; wings hyaline, talc-like, extreme base and most of veins on basal half ochraceous or stramineous, venation on apical half and the veins to anal area piceous or black; eyes robustly sessile; face broadly globose, finely transversely

striate, medially longitudinally interrupted; rostrum reaching the intermediate coxæ; body beneath greyishly pilose and the abdominal segments narrowly margined with ochraceous.

Long., excl. tegm., ♀, 36 mm.; exp. tegm. 118 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

Macrotristria Hillieri, sp. n.

Vertex black, the lateral margins, two transverse basal lines near inner margins of eyes, and a central basal point behind ocelli pale ochraceous; pronotum black, the lateral areas gradually broadening from disk piceous brown, a central longitudinal line, the posterior margin (narrowly) and which is extended upwardly near each posterior angle, and the anterior angle of lateral margins pale ochraceous; mesonotum black, two central, obconical, dark castaneous spots, which are narrowly margined with pale ochraceous, the lateral margins greyishly pilose, the cruciform elevation ochraceous; lateral margins of the metasternum ochraceous; abdomen above black, the abdominal margins (narrowly transversely and broadly laterally) and the apical segment calcareously tomentose, the white lateral margins spotted with black; body beneath more or less greyishly tomentose; a small central spot on basal margin of face, a large transverse spot between face and eyes, posterior margins to the sternal and abdominal segments, opercula, coxæ, and apices of the femora, ochraceous; rostrum black, ochraceous at base; tegmina and wings pale hyaline, talc-like, tegmina with the venation ochraceous at base, piceous on apical two thirds, costal and postcostal areas black margined with ochraceous; wings with the veins mostly ochraceous, a few black on basal area; head above subangularly produced, the front prominent; face globosely compressed, strongly transversely ridged, with a central longitudinal carinate line; rostrum reaching the posterior coxæ; opercula in the male transverse, well separated internally, moderately broadly convex posteriorly, not extending beyond the basal segment.

Long., excl. tegm., ♂ ♀, 27-32 mm.; exp. tegm. 91-102 mm.

Hab. N. T., S. Australia; Hermansburg (*H. J. Hillier*, Brit. Mus.).

Cicada Knowlesi, sp. n.

Vertex from base to the anterior margins of the eyes black, its lateral margins, ocelli, and front ochraceous, base of front and a transverse spot at the apex of each lateral margin

black; face ochraceous, with a central discal spot, the cheeks, and clypeus black, a large irregular spot at inner margin of each eye and a longitudinal line to clypeus ochraceous; pronotum ochraceous, the lateral and posterior margins, anterior margin (centrally interrupted), and the furrows black; mesonotum ochraceous, with two large anterior, central, obconical spots, on each side of which is a smaller obconical spot, two spots in front of the basal cruciform elevation, and the posterior lateral margins black; abdomen above ochraceous, with a basal, central, greyish spot, the margins of the segment, two oblique, longitudinal, central fasciæ on the apical and anal segments, and a sublateral series of spots, black; body beneath black; legs, transverse abdominal fasciæ, and lateral marginal spots ochraceous; coxæ, apical spots to anterior and intermediate femora beneath, and tarsal claws, black; tegmina hyaline, tale-like, the venation ochraceous, much darker on apical area, base of costal area and the postcostal area black, basal area tinged with pale sanguineous; wings subhyaline, the venation ochraceous, basal area tinged with pale sanguineous; vertex with three central longitudinal furrows; face centrally smooth, laterally transversely striate, pronotum with the lateral furrows behind the eyes broadly foveately excavate; opercula in male short, transverse, rounded posteriorly, scarcely extending over base of abdomen, not meeting inwardly, black, with their posterior and lateral margins narrowly and obscurely ochraceous; rostrum just passing the posterior coxæ.

Long., excl. tegm., ♂, 33 mm.; exp. tegm. 101 mm.

Hab. Fiji Islands (*C. Knowles*, Brit. Mus.).

Subfam. *GÆANINÆ*.

Division *CICADATRARIA*.

Tamasa tristigma.

Cicada tristigma, Germ. in Silb. Rev. Ent. ii. p. 69 (1834).

Tettigia tristigma, Stål, Ann. Soc. Ent. Fr. 1861, p. 617.

Tibicen kurandæ, God. & Frogg. Proc. Linn. Soc. N. S. Wales, 1904, p. 605.

Tibicen Doddi, God. & Frogg. loc. cit. p. 602.

A species very variable in size; the British Museum now possesses a fair series of specimens collected by Mr. Dodd in Queensland, and I am indebted to the kindness of Mr. Froggatt for cotypes of his species.

Subfam. *TIBICININÆ*.Division *TAPHURARIA*.*Abrieta Stalkeri*, sp. n.

♂. Vertex black; front testaceous; ocelli testaceous, and in some specimens a distinct small, central, ochraceous spot at base of vertex; pronotum ochraceous, the margins, a broad, central, longitudinal fascia (which is dilated anteriorly and posteriorly), and the furrows pale castaneous, edge of basal margin black; mesonotum pale castaneous, two obscure obconical spots at anterior margin, which are only denoted by their paler margins, lateral margins, and also the lateral margins of the metanotum, greyishly pilose; abdomen above pale castaneous, the posterior segmental margins narrowly obscurely virescent and the anterior margins broadly dark castaneous; body beneath and legs brownish ochraceous, the area between face and eyes black; coxæ, base of rostrum, and opercula in male pale ochraceous; tegmina hyaline, the venation ochraceous, extreme base, costal and postcostal areas ochraceous, the latter centrally streaked with greyish, upper apical area, and broad margins to the transverse veins at bases of second, third, and fourth apical areas, fuscous brown, posterior claval margin from about one third from base fuscous brown; wings hyaline, the venation, extreme base, and anal area pale ochraceous, at outer posterior angle of anal area a somewhat large fuscous-brown spot; face reddish castaneous, with a central, longitudinal, linear incision, the lateral areas broadly transversely striate; clypeus with a piceous spot on each side; rostrum reaching the posterior coxæ, its apical area black; opercula short, somewhat obliquely directed inwardly, widely separated internally, their posterior margins subtruncate and not passing base of abdomen.

Long., excl. tegm., ♂ ♀, 18-18½ mm.; exp. tegm. 50-55 mm.

Hab. N. T., S. Australia; Alexandria (*W. Stalker*, Brit. Mus.); W. Australia; Nicol Bay (Coll. Dist.).

Abrieta Frenchi, sp. n.

♂. Body above black; front, vertex, and pronotum with a broken, central, longitudinal, testaceous fascia, in some specimens scarcely visible; lateral margins of vertex, posterior and lateral margins of pronotum, two discal inwardly angulated longitudinal fasciæ and lateral margins to meso-

notum, margins of metanotum, and abdominal segmental margins, testaceous; body beneath black; face, lateral areas of sternum, opercula, and abdominal margins testaceous; legs ochraceous, spots to coxæ and trochanters, longitudinal streaks or spots to femora, and apices of tibiæ and tarsi black; tegmina bronzy-brown subhyaline, veins mostly ochraceous before and piceous beyond middle, transverse veins at bases of first, second, and third apical areas broadly margined with black, costal margin black, costal area sanguineous; wings subhyaline, with the venation ochraceous; body robust; pronotum strongly furrowed; opercula short, transverse, well separated internally, posterior margins moderately convex, not passing the basal abdominal segment; rostrum reaching the intermediate coxæ; tegmina short and broad.

Long., excl. tegm., ♂ ♀, 16–18 mm.; exp. tegm. 34–38 mm.

Hab. Victoria; Woori Yallock (*C. French, Jun.*).

Allied to the Tasmanian *A. aurata*, Walk., from which it differs by the more outwardly rounded opercula, infuscate tegmina, and globose abdomen, not depressed on lateral areas as in Walker's species.

Burbunga venosa, sp. n.

Vertex and front castaneous, lateral margins of vertex ochraceous, ocelli red; pronotum ochraceous, the furrows and sometimes a central longitudinal fascia brownish; mesonotum greyish ochraceous, with four obconical castaneous spots, the two central ones shorter; abdomen above ochraceous, the anterior margins of the last four segments castaneous, a castaneous spot on each side of the anterior margin of the apical segment; body beneath and legs ochraceous, face testaceous, abdomen beneath shaded with brownish; tegmina and wings hyaline, talc-like; tegmina with the venation as far as the apical areas stramineous, veins and transverse veins of the apical areas fuscous, costal margin fuscous, costal area stramineous; wings with the veins pale stramineous, the outer marginal and tips of the apical veins palely fuscous; head with the front prominent, in breadth considerably narrower than lateral margins of vertex; vertex with three longitudinal impressions; face prominent, globose, strongly transversely striate, centrally longitudinally interrupted; opercula in male somewhat obliquely directed inwardly, their posterior margins truncate, well separated internally; rostrum only just passing the intermediate coxæ.

Long., excl. tegm., ♂ 18, ♀ 15 mm.; exp. tegm. 49–50 mm.

Hab. N. T., S. Australia (*H. J. Hillier*, Brit. Mus.).

Burbunga albofasciata, sp. n.

♀. Body above pale ochraceous; pronotum with four silvery-white, sericeous, longitudinal fasciæ, the two central shorter and not extending beyond the anterior margin of the basal cruciform elevation, the two outermost longer and at lateral margins; abdomen above with three similar discal fasciæ; body beneath and legs pale ochraceous, lateral margins of the sternum and abdomen sericeously white; tegmina and wings hyaline, talc-like; tegmina with the costal area and veins stramineous, the veins defining the posterior margin of the radial area, the veins defining the second ulnar area, and almost the whole venation defining the apical areas, fuscous; wings with the venation stramineous, the outer and upper venation more or less fuscous; head with front prominent, in breadth considerably narrower than lateral margins of vertex; vertex with three longitudinal incisions; pronotum with two central discal ridges enclosing a flattened somewhat darker fascia; face strongly produced, laterally compressed, strongly transversely striate, narrowly longitudinally interrupted at middle; rostrum reaching the posterior coxæ.

Long., excl. tegm., ♀, 15 mm.; exp. tegm. 46 mm.

Hab. N. T., S. Australia; Alexandria (W. Stalker, Brit. Mus.).

Division CHLOROCYSTARIA.

Bæturia varicolor, sp. n.

Virescent; posterior margins of the abdominal segments above a little darker; disk of abdomen beneath, tibiæ (excluding bases), and the tarsi sanguineous; tegmina and wings hyaline, the venation greenish or ochraceous, tegmina with the costal area more or less ochraceous and with eight apical areas; wings with six apical areas.

Var. *a*.—Head, pro- and mesonota pale testaceous; abdomen above testaceous, abdomen beneath and costal area of tegmina sanguineous.

Var. *b*.—Body above and costal area of tegmina sanguineous; body beneath and legs ochraceous; tibiæ, tarsi, and discal posterior marginal abdominal segments sanguineous.

♂. Tympana entirely exposed; opercula elongate, oblique, not reaching base of abdomen, and only inwardly covering the cavities; rostrum reaching the posterior coxæ, its apex piceous; face somewhat elongate, lateral areas oblique,

strongly transversely striate, centrally finely longitudinally sulcate; abdomen moderately inflated.

Long., excl. tegm., ♂ 19-20, ♀ 18 mm.; exp. tegm., ♂ 47-49, ♀ 54 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

Bæturia modesta, sp. n.

♂ ♀. Virescent or ochraceous, probably virescent in fresh or living specimens; ocelli red; tibiæ and tarsi more or less testaceous; tegmina and wings hyaline, the venation virescent or ochraceous.

♂. Uniformly ochraceous in typical specimen; front anteriorly transversely subangulate, and centrally sulcate between the ocelli; pronotum with a central, flattened, longitudinal, concolorous, fasciate impression, which neither reaches the anterior nor posterior margin, the lateral posterior angles somewhat broadly posteriorly produced; face with the lateral areas oblique, strongly transversely striate, narrowly longitudinally sulcate; rostrum reaching the intermediate coxæ; opercula very small, oblique, apically subangulate, scarcely extending halfway across the cavities, and leaving the posterior and interior areas widely exposed.

♀. Uniformly virescent in typical specimen.

Long., excl. tegm., ♂ 15, ♀ 12 mm.; exp. tegm., ♂ 40, ♀ 38 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

Allied to *B. varicolor*, Dist., but a smaller species; the opercula in the male much shorter and smaller and the cavities much more exposed.

Mardalana suffusa, sp. n.

Vertex, pro- and mesonota virescent; anterior margin of front, a transverse spot to vertex near anterior margins of eyes, surrounding area to each ocellus, two central longitudinal fasciæ to pronotum and the furrows and lateral margins, four obconical spots to mesonotum, the lateral longest, extending whole length of mesonotum, the central short and meeting two slightly curved fasciæ which start from two spots in front of cruciform elevation, purplish brown; head beneath, sternum, and legs virescent, posterior area of the face, coxæ, and femora more or less spotted with purplish brown; tegmina and wings hyaline, the venation dull virescent or brownish ochraceous, tegmina with the costal area virescent streaked with testaceous, extreme bases of both tegmina and wings ochraceous.

♂. Abdomen somewhat strongly inflated, pale greenish ochraceous, the margins of the abdominal segments testaceous brown.

♀. Abdomen normal, not inflated, dull virescent, a broad obscure, dark, central, longitudinal fascia above, and a narrower and more distinct, longitudinal, central, purplish-brown fascia beneath.

♂ ♀. Rostrum reaching the posterior coxæ, its apex purplish brown; face strongly transversely striate, centrally, narrowly, longitudinally sulcate; tegmina with eleven, wings with five apical areas.

Long., excl. tegm., ♂ 25, ♀ 20 mm.; exp. tegm., ♂ 60, ♀ 62 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

Division MELAMPALTARIA.

Melampsalta Froggatti, sp. n.

♀. Head, pronotum, and mesonotum black, shortly greyish pilose; vertex with the ocelli, a short basal longitudinal sulcation between them, and a spot near middle of lateral margins purplish red, anterior margin of front more or less reddish; pronotum with a central longitudinal fascia not reaching base, the furrows and extreme posterior margin, testaceous; mesonotum with two faint obconical spots margined with purplish at middle of anterior margin, the lateral margins and cruciform elevation also purplish red; abdomen above somewhat purplish red; head beneath black, face and clypeus purplish red, face with the basal margin and two central longitudinal fasciæ united posteriorly black; body beneath and legs purplish red; apex of rostrum black; disk of abdomen beneath piceous; tegmina and wings hyaline, tale-like, with their bases purplish red, the tegmina with a slightly pale ochraceous tint, costal area and the venation ochraceous, base of costal area purplish red; face globose, centrally sulcate for half its length, its lateral areas strongly transversely striate, rostrum reaching the intermediate coxæ.

Long., excl. tegm., ♀, 13 mm.; exp. tegm. 40 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.); Cairns (Colls. Froggatt and Dist.).

Melampsalta hermansburgensis, sp. n.

Body virescent, inclining here and there to ochraceous; legs ochraceous (in fresh and living specimens probably uniformly virescent); tegmina and wings hyaline, tale-like,

bases of both narrowly ochraceous, venation and the costal area of tegmina ochraceous.

♀. Body very robust; front somewhat subangularly prominent; ocelli purplish red; pronotum with two central longitudinal lines, which broaden outwardly a little anteriorly and very widely so posteriorly; between these lines on anterior disk the surface is deepened or sulcate; face globose, strongly, centrally, longitudinally sulcate, lateral areas robustly transversely striate; rostrum slightly passing the intermediate coxæ; tegmina with the bases of the upper vein to lower ulnar area and the lower vein to radial area fused for less than the length of basal cell.

Long., excl. tegm., ♀, 17–18 mm.; exp. tegm. 50 mm.

Hab. N. T., S. Australia; Hermansburg (*H. J. Hillier*, Brit. Mus.).

Melampsalta kewelensis, sp. n.

♀. Vertex and front black; a central longitudinal fascia to front, lateral margins of vertex, and a basal spot between the ocelli pale ochraceous; pronotum brownish ochraceous, mottled with piceous, a broad, central, hourglass-shaped, black fascia, containing a central, elongate, pale ochraceous spot, anterior, posterior, and lateral margins pale ochraceous, sublateral and subbasal margins black; mesonotum black, with two central longitudinal fasciæ, the anterior halves of which are narrow, the posterior halves widened, notched, and continued to basal cruciform elevation, and a large oblong spot on each lateral margin, pale ochraceous; cruciform elevation pale ochraceous; abdomen above black, the segmental margins and the apical segment pale ochraceous, the latter with three longitudinal black fasciæ; head beneath black; a basal spot and margins to face, a transverse basal line between face and eyes, and apex of clypeus, pale ochraceous; body beneath and legs pale ochraceous; coxæ and legs spotted or streaked with black; tegmina hyaline, talc-like, the venation dull ochraceous, postcostal margin, upper margin of basal cell, and base of posterior claval margin black; wings hyaline, the venation ochraceous; rostrum reaching the posterior coxæ; tegmina with the upper vein to lower ulnar area and the lower vein of radial area fused for about the length of basal cell.

Long., excl. tegm., ♀, 17 mm.; exp. tegm. 40 mm.

Hab. Victoria; Kewel (*Hill*).

Allied to *M. Waterhousei*, Dist.

Melampsalta murrayensis, sp. n.

♂. Vertex, front, pronotum, and mesonotum black; a small central elongate spot between and a similar one in front of ocelli, a central longitudinal line on anterior half of pronotum, and two linear discal spots to mesonotum, dull ochraceous; lateral posterior margins of pro- and mesonota, and base of cruciform elevation, pale ochraceous; abdomen orange-yellow, above with two transverse basal fasciæ and three longitudinal segmental series of four spots each, one series central, the other two lateral; head beneath and sternum black; legs ochraceous, femora and coxæ strongly streaked with black; rostrum reaching the posterior coxæ; opercula small, rounded, not extending inwardly beyond the posterior coxæ, not backwardly beyond the base of abdomen; tegmina with the bases of lower vein to radial area and upper vein to lower ulnar area fused for less than the length of basal cell.

Long., excl. tegm., ♂, 11 mm.; exp. tegm. 30 mm.

Hab. Victoria; N.W. Murray River (C. French, Jun.).

Melampsalta sulcata, sp. n.

♂. Vertex and front black, greyishly pilose; basal lateral margins of vertex and a spot on lateral margins of vertex sanguineous; a longitudinal sulcation between the ocelli testaceous; pronotum testaceous, centrally longitudinally sulcate, submarginally narrowly piceous; mesonotum testaceous, with four obconical black spots—two small, central, and not extending far from anterior margin, and a larger one on each lateral area reaching the anterior angles of the cruciform elevation; abdomen above testaceous, the segmental margins sanguineous, a series of obscure fuscous segmental spots on each lateral area; body beneath and legs sanguineous, face with two central, broad, longitudinal, black fasciæ, united anteriorly; the cheeks and area between face and eyes black, thickly palely pilose; rostrum reaching the intermediate coxæ, face medially longitudinally sulcate; opercula narrow, roundly obliquely directed inwardly, but widely separated; tegmina and wings hyaline, tale-like, their bases narrowly sanguineous, the venation dull greyish; tegmina with the bases of the lower vein to radial area and the upper vein to lower ulnar area fused for a little less than the length of basal cell.

Long., excl. tegm., ♂, 13 mm.; exp. tegm. 37 mm.

Hab. Cape York.

Melampsalta arenaria, sp. n.

♂. Vertex, front, and pronotum black, thickly somewhat longly pilose; lateral margins of vertex, a central longitudinal fascia to vertex and pronotum, on the latter widened posteriorly, and the lateral and posterior margins of pronotum pale ochraceous, on each side of the central fascia the whole pronotal lateral areas are more or less testaceous, with the furrows blackish; mesonotum black, with two central, longitudinal, angulated, pale ochraceous fasciæ, which are narrow at anterior margin and angularly widened before the anterior angles of the cruciform elevation, which is ochraceous, with its anterior angles black; abdomen above black, the segmental margins obscure brownish ochraceous; head beneath, sternum, and legs ochraceous; abdomen beneath dull obscure ochraceous; lateral margins and apex of face and apices of tarsal claws black; tegmina and wings hyaline, the venation and costal area of tegmina ochraceous; face with the lateral areas oblique and strongly transversely striate; rostrum reaching the intermediate coxæ, its apex black; metasternum black; opercula short, broadly transverse, posteriorly subtruncate, not meeting but not very widely separated internally; the bases of the lower vein to radial area and the upper vein to lower ulnar area shortly fused and only for about one third the length of basal cell.

Long., excl. tegm., ♂, 15-17 mm.; exp. tegm. 31-37 mm.

Hab. Sydney (*H. Ashton*, on the sands).

Pauropsalta endeavourensis, sp. n.

♂. Vertex and front black, a spot at apex of front and the lateral margins of vertex pale ochraceous; ocelli red; pronotum reddish testaceous, with a central, longitudinal, pale ochraceous fascia margined with black, margins pale ochraceous, the furrows, a curved line on each lateral area, and a spot on lateral margin black; mesonotum black, two discal longitudinal fasciæ, which are inwardly angulated and dilated and almost meet at middle, testaceous, ochraceous near anterior margin; cruciform elevation and margins of metanotum pale ochraceous; abdomen above ochraceous, the segmental margins and a series of central and lateral spots more or less black and greyishly pilose; head beneath black, margins of face ochraceous; sternum, legs, and abdomen beneath ochraceous; spots to coxæ and sternum, femora (excluding apices), margins of metasternum, and a spot on each side of apical

segment piceous or black; tegmina and wings hyaline, the venation mostly fuscous, costal area to tegmina and veins to anal area of wings pale ochraceous; opercula short and posteriorly rounded; rostrum reaching the intermediate coxæ; bases of the lower vein to radial area and upper vein to lower ulnar area fused for more than the length of basal cell.

Long., excl. tegm., ♂ 12, ♀ 14 mm.; exp. tegm., ♂ 32, ♀ 35 mm.

Hab. Queensland; Endeavour River.

Mr. Froggatt kindly sent me a male and a female specimen of this species.

Urabumana festiva, sp. n.

♂. Vertex of head and front black; a spot on each lateral margin of front, lateral margins of vertex, and a spot before each eye pale ochraceous; pronotum pale ochraceous, with a broad, central, longitudinal, shining black fascia, which inwardly contains a short pale discal streak, posterior margin narrowly inwardly black; mesonotum paler or more stramineous than the pronotum, with a broad, central, shining black, longitudinal fascia extending through the cruciform basal elevation, and a long obconical spot of the same colour on each lateral area; abdomen above stramineous, first and second segments (excluding lateral margins) and disks of the other segments (gradually decreasing in width towards apex) shining black; body beneath and legs very pale ochraceous; central area of face, anterior and posterior lateral margins of face, anterior tibiæ and tarsi, and the rostrum black; tegmina and wings hyaline, talc-like, the venation stramineous or pale virescent, postcostal margin and the outer margins to the apical areas black; opercula small and transverse; abdomen globose beneath; wings with four apical areas (in a male specimen now before me only three apical areas, which is clearly a malformation).

Long., excl. tegm., ♂ ♀, 13 mm.; exp. tegm. 32 mm.

Hab. Victoria; Kewel (*Hill*).

LVIII.—*Description of a new Genus and Species of Cerambycidae from Natal.* By W. L. DISTANT.

Subfam. CERAMBYCINÆ.

GAHANIA, gen. nov.

♂. Head with front short, slightly concave from side to

side, marked off from clypeus by a distinct arcuate groove; eyes rather coarsely granulate, emarginate, the lower lobes large; antennæ about three fourths the length of body, stout, first joint slightly curved, gradually thickened to apex, third shorter than fourth or following, these angulate in front of apex; pronotum transverse, armed with a short conical tubercle at middle of each side, and three obtuse tubercles on disk; mesonotum without stridulatory area; elytra feebly convex, semitransparent, polished, obtusely rounded at apex, with a short spine on each side at suture; anterior coxæ strongly transverse, but having their acetabula closed behind by extension inwards of epimera to meet the prosternum, acetabula of middle coxæ extending to epimera; posterior legs much longer than anterior or intermediate legs, their femora reaching to apex of elytra, first joint of posterior tarsi almost as long as the following two united; first abdominal segment almost as long as the following three together.

Allied to *Megacælus*, Lac., but with larger and more coarsely granulated eyes; elytra longer and not dehiscent at the apex; femora less thickened and the anterior coxal cavities closed behind.

I have dedicated this genus to my friend C. J. Gahan, the well-known authority on the Longicornia and an ever helpful adviser to other workers.

Gahania Simmondsi, sp. n.

♂. Head, antennæ, thorax, body beneath, and legs pale brownish ochraceous; eyes black; elytra pale shining ochraceous, the basal area and sutural margins pale brownish ochraceous, the subcostal areas behind middle distinctly paler; head finely somewhat sparingly punctate, coarsely rugulose on disk between eyes, centrally, finely, longitudinally sulcate on posterior disk and between the antennal bases, front longly pilose; pronotum coarsely punctate and granulose, strongly transversely depressed behind anterior margin, a much narrower and finer transverse impression before basal margin, tubercles as in generic description, of the three discal the central is smaller and situate a little behind the others, the conical lateral tubercles have their apices black; elytra polished, semitransparent, sparingly finely punctate, the punctures more distinct on the darker basal area; the first three joints of the antennæ have outwardly a few long hairs, and the lateral margins of the pronotum are longly sparingly pilose; body beneath and legs somewhat thickly pilose.

Long., ♂, 23 mm.

Hab. Natal; Durban (H. W. Simmonds, Coll. Dist.).

A male specimen of this species was taken by Mr. Simmonds, of New Zealand, when on a recent visit to Natal. That specimen is now in my collection, having been presented to me by its discoverer. Mr. Bell Marley also tells me he took another specimen at about the same time and locality. I hope to eventually figure the species in my 'Insecta Transvaaliensia.'

LIX.—*Description of a new Species of Cicadidæ from East Africa.* By W. L. DISTANT.

Pycna Elliotti, sp. n.

♂. Head, pronotum, and mesonotum pale virescent, thickly greyishly pilose; some spots to front, area of the ocelli, and inner margins of the eyes piceous; pronotum with two central longitudinal fasciæ, united into a broad fascia on posterior half, and from the middle of which there proceeds on each side an oblique line to eyes, the furrows, and a broad oblique spot on each side of the posterior margin near the outer angles, piceous; mesonotum with two small obconical spots on anterior margin, on each side an oblique line reaching middle, where it is inwardly recurved, a transverse linear spot near each anterior angle of the cruciform elevation and the lateral areas broadly (enclosing a large pale spot at base and apex) piceous; abdomen above piceous, the segmental margins broadly and a central longitudinal fascia virescent; body beneath and legs pale ochraceous; head beneath (including face), large spots to femora, bases and apices of tibiae and tarsi, apex of rostrum, basal abdominal segment, and the segmental margins piceous or black; basal margin of face, a basal transverse spot between face and eyes, and the clypeus pale virescent; tegmina with nearly basal half opaque, greyish, with the veins virescent, two spots on costal membrane, two in apical half of radial area, and a transverse fascia at end of pale opaque area piceous, remaining area of tegmina hyaline, the veins testaceous, with piceous spots, more particularly in transverse marginal and submarginal apical series; wings bright pale ochraceous, opaque, and outwardly margined with piceous for more than half their length, the apical area hyaline; rostrum reaching the second abdominal segment; opercula short,

transverse, not meeting inwardly, pronotal lateral margins only moderately angularly produced.

Long., excl. tegm., ♂, 22 mm.; exp. tegm. 68 mm.

Hab. Brit. East Africa; Nairobi (*C. F. Elliott*, Brit. Mus.).

Allied to *P. hecuba*, Dist., from which it differs by the very much less produced pronotal margins, the opercula not meeting internally (in *P. hecuba* they overlap), the opaque colouring of the wings is more extensive and extends to the anal area, tegmina paler, &c.

LX.—*Four new European Squirrels.*

By GERRIT S. MILLER.

AMONG the 275 skins of European squirrels in the British Museum are representatives of the following four hitherto unnamed forms:—

Sciurus vulgaris rutilans, subsp. n.

1899. *Sciurus vulgaris rufus*, Barrett-Hamilton, Proc. Zool. Soc. Lond. p. 5 (part.). Not of Kerr, 1792.

1906. *Sciurus vulgaris rufus*, Trouessart, Bull. Mus. d'Hist. Nat. Paris, xii. p. 360 (part.). Not of Kerr, 1792.

Type.—Adult male (skin and skull). B.M. no. 95. 4. 18. 7. Collected at Rudolstadt, Schwarzburg, Germany, December 24, 1894. (Lilford Collection.)

Diagnosis.—Colour much brighter than in *Sciurus vulgaris vulgaris*, the body clear rufous* in summer, rufous tinged with light smoke-grey along sides in winter; tail at all seasons clear rufous, usually somewhat darker than body. Brown phase (occasional but much less frequent than red phase): body a grizzled hair-brown, suffused with mummy-brown over back; tail slaty black.

Measurements.—Type: head and body 223 mm.; tail-vertebræ 175; hind foot 62; ear from meatus 27. Skull: condylo-basal length 46·6; mastoid breadth 25; postorbital constriction 18; interorbital constriction 17; rostral breadth at front of nasals 8·6; nasal 15·4; diastema 12·2; mandible 33; maxillary tooth-row (alveoli) 9·6; mandibular tooth-row (alveoli) 9·6.

Specimens examined.—Fifty-five from the following

* The exact shade in the type between the cinnamon-rufous and orange-rufous of Ridgway, but somewhat lighter than either.

localities:—*Germany*, Marxheim, Bavaria, 5; Blumenthal, Hannover, 2; Marburg, Hessen-Nassau, 2; Ilsenburg, Saxony, 7; Magdeburg, Saxony, 1; Wernegerode, Saxony, 1; Strass, near Burgheim, Schwaben, 8; Niesky, Silesia, 1; Rudolstadt, Thüringen, 4; Ummerstadt, Thüringen, 12; Neustadt, Wied, 4: *Austria-Hungary*, Haida, Bohemia, 1; Karlsbad, Bohemia, 1; Hatszeg, Hungary, 1: *Roumania*, Bustenari, 5.

Remarks.—This is the bright-coloured squirrel of Central Europe, ranging from Germany eastward through Austria-Hungary to Roumania. In Switzerland it apparently intergrades with *S. vulgaris italicus*, in which the brown phase is dominant, but the exact relationship between these two forms is not yet clearly understood, and for this reason I have omitted the Swiss specimens from the list of material examined. To this animal and the next the name *rufus* has been applied by Barrett-Hamilton and Trouessart, but Kerr's *Sciurus vulgaris rufus** is strictly a synonym of *S. vulgaris vulgaris*, and therefore cannot be used in this sense.

Sciurus vulgaris rufus, subsp. n.

1899. *Sciurus vulgaris rufus*, Barrett-Hamilton, Proc. Zool. Soc. Lond. p. 5 (part.). Not of Kerr, 1792.

1906. *Sciurus vulgaris rufus*, Trouessart, Bull. Mus. d'Hist. Nat. Paris, xii. p. 360 (part.). Not of Kerr, 1792.

Type.—Adult male (skin and skull). B.M. no. 97. 11. 6. 2. Dinan, Côtes-du-Nord, France, October 29, 1897. Collected and presented by W. Jennings Bramley, Esq.

Diagnosis.—Similar to *Sciurus vulgaris rutilans*, but with colour in red phase darker and less bright, the body cinnamon-rufous strongly tinged with chestnut in summer, hazel † much suffused with dull light smoke-grey along sides in winter; tail at all seasons a light bright chestnut (Ridgway). Brown phase infrequent, similar to that of *rutilans*.

Measurements.—Type: head and body 202 mm.; tail-vertebræ 166; hind foot 54; ear from meatus 30. Skull: condylo-basal length 46; zygomatic breadth 29; mastoid breadth 24.6; postorbital constriction 16.8; interorbital constriction 15.4; rostral breadth at front of nasals 7.4; nasal 15.2; diastema 12.4; mandible 31.4; maxillary tooth-row (alveoli) 9; mandibular tooth-row (alveoli) 8.6.

* 'Animal Kingdom,' p. 255 (1792).

† In the type the exact shade of the red is slightly paler than hazel, but the general effect produced by the light and dark annulations is intermediate between hazel and chestnut.

Specimens examined.—Twenty-two, from the following localities :—*Holland*, Oosterbeek, 2; Graveland, 4: *France*, Dinan, Côtes-du-Nord, 4; Duclair, Seine-Inférieure, 2; Seine-Inférieure, no exact locality, 3; Manonville, Meurthe-et-Moselle, 2; Meurthe-et-Moselle, no exact locality, 5.

Remarks.—While the exact limits of the range of this squirrel are still unknown, it is probable that the animal occupies the coast-region from Denmark southward at least to Brittany. In the Landes of South-western France it is apparently replaced by the North-Spanish squirrel or a closely related form. Westward it extends across France to the Valley of the Moselle.

In colour, as well as in range, *Sciurus vulgaris russus* and *S. v. rutilans* correspond with the two races of red-backed voles, *Evotomys hercynicus rubidus* and *E. h. hercynicus*, occurring in the same regions.

Sciurus vulgaris numantius, subsp. n.

1905. *Sciurus* sp., Cabrera, Bol. Real Soc. Españ. Hist. Nat. iv. pp. 224, 231 (April 1905).

1905. *Sciurus* *rufus*, Cabrera, Bol. Real Soc. Españ. Hist. Nat. iv. p. 225 (April 1905).

Type.—Adult female (skin and skull) collected by Gerrit S. Miller, at Pinares de Quintanar de la Sierra, Province of Burgos, Spain, October 28, 1906. Original number 7418.

Diagnosis.—Size greater than in the Central-European forms, but less than that of *Sciurus infuscatus*, Cabrera. Colour of upperparts in light phase not as dark as in *S. infuscatus*, and tail never with white median area on lower surface.

Colour.—*Type*: head, back, sides, and outer surface of legs a uniform indistinctly grizzled brown, intermediate between the broccoli-brown and wood-brown of Ridgway; a faint russet tinge along middle of back. Muzzle and fore part of face between ochraceous-buff and clay-colour. Cheeks drab. Ear-tufts blackish brown. Sides of neck pale dull wood-brown. Inner surface of legs and ill-defined stripe along sides of belly dull light hazel. Feet like inner side of legs, but paler. Tail a very dark rufous, approaching the chestnut of Ridgway, especially near base, but rather more red; median portion of tail below lighter, the hairs buffy grey through basal half, each with two drab annulations. Underparts buffy white, the chin and interramial region light ecru-drab.

In the dark phase the tail is clear bluish black, very faintly

grizzled along median region below, and the back is much darkened by a blackish suffusion.

Colour variation shows itself chiefly in the greater or less tendency to assume the dark phase. Occasionally the hazel of sides brightens nearly to a dull rufous and spreads to lateral portion of dorsal area, the portion bordering white of ventral surface at the same time becoming nearly buff. Ear-tufts either blackish or reddish.

Skull and teeth.—The skull and teeth are intermediate in size between those of the ordinary Central-European forms (*russus* and *rutilans*) and the large *S. infuscatus*. In form they show no special peculiarities.

Measurements.—Type: head and body 237 mm.; tail-vertebræ 230; hind foot 66; ear from meatus 34. Skull: condylo-basal length 50; zygomatic breadth 33; mastoid breadth 26; postorbital constriction 17.4; interorbital constriction 18.8; rostral breadth at front of nasals 8.2; nasals 16; diastema 13; mandible 34; maxillary tooth-row 9.8; mandibular tooth-row 10.

Specimens examined.—Nineteen, from the following localities:—*France*, Solférino, Landes, 1; St. Jean de Luz, Basses Pyrénées, 1; *Spain*, Sierra de Dabros, Asturias, 2; Arrechavaleta, Vitoria, 2; Panticosa, Huesca, 6; Pinares de Quintanar de la Sierra, Burgos, 7.

Remarks.—This squirrel is evidently the *Sciurus* sp.? of Mr. Cabrera's review of the Spanish members of the genus, as its characters agree with those assigned to this problematic form. It is also without much doubt the *rufus* of the same paper, though on this point the evidence is not so clear. Whatever the squirrel of the Lower Ebro Valley may be, it is very unlikely to prove identical with either *russus* or *rutilans*, the two forms confused under the name *rufus* at the time when Mr. Cabrera wrote.

Sciurus vulgaris lilæus, subsp. n.

1906. *Sciurus vulgaris italicus*, Trouessart, Bull. Mus. d'Hist. Nat. Paris, xii. p. 364 (part.).

Type.—Young adult female (skin and skull). B.M. no. 7.9.8.1. Agoriani, north side of Lyakura (Parnassus) Mts., Greece. Received from Wilhelm Schlüter.

Diagnosis.—Colour in brown phase peculiar in the noticeable contrast of the very dark almost blackish posterior half of back with hair-brown shoulders and neck. Red phase not known, and probably rare or absent.

Colour.—Type: general colour above a grizzled hair-

brown, paler and more grey on cheeks and across muzzle, much darkened with blackish on posterior half of back and on outer surface of hind legs. Inner surface of hind legs and line along sides of body bordering white of underparts tawny-ochraceous, becoming lighter and duller anteriorly and continued along sides of neck and spreading over outer surface of fore legs. Feet dull tawny-ochraceous suffused with blackish. Tail blackish suffused with tawny-ochraceous beneath surface. Underparts creamy white; chin and interramial region light drabby grey.

Skull and teeth.—The skull and teeth show no special peculiarities.

Measurements.—Type: hind foot 60 mm.; ear from meatus 29. Skull: zygomatic breadth 31.4; postorbital constriction 17.8; interorbital constriction 17; rostral breadth at front of nasals 7.4; nasal 14; diastema 12.8; mandible 32.4; maxillary tooth-row 9.8; mandibular tooth-row 9.8.

Specimens examined.—Three, all from the type locality.

LXI.—*New Species of African and Indo-Malayan Hesperiidæ.* By Colonel C. SWINHOE, M.A., F.L.S., &c.

Family Hesperiidæ.

Casyapa kallima, nov.

♂ ♀. Dark olive-brown; frons, palpi, body below, and legs bright orange-ochreous; antennæ with ochreous and brown bands: fore wings with a very broad and prominent orange-ochreous band from the outer margin above the hinder angle, which it does not reach, to the middle of the costa, running inwards for some distance along the costal vein, just below its middle the band is slightly contracted; cilia of both wings dark brown; no other markings above or below.

Expanse of wings, ♂ $2\frac{1}{10}$, ♀ $2\frac{5}{16}$ inches.

Milne Bay, New Guinea (types in B. M.).

Allied to *C. callixenus*, Hew., from Dorey.

Tagiades louisa, nov.

♀. Blackish brown; palpi white beneath; frons with a white spot on each side: fore wings with two large hyaline spots at the end of the cell, one outside its lower angle and

another close beneath it, all more or less triangular; a subapical row of six small spots in the usual recurved line: hind wings with about one half of the lower portion white, the white running up the abdominal margin to the base; two very large black spots in the middle of the disc touching the inner side of the outer curve of the brown portion of the wing; no marginal marks or spots. Underside with two additional hyaline spots on the fore wings near the hinder angle; hind wings with a somewhat narrow black costal border, the two discal spots much smaller, and one minute black mark on the outer border below the middle; legs and body white.

Expanse of wings 2 inches.

Rossel Island (type in B. M.).

Sarangesa haplopa, nov.

♂. Dark blackish brown with a slight red tinge; palpi whitish below: wings above with spots and bands much as in *subalbicans*, Bethune-Baker, but the submarginal band of the fore wings is curved evenly with the outer margin; a hyaline spot on the upper part of the cell at three fourths and another immediately above it; a small round spot below the lower end of the cell and a larger triangular spot immediately below it, also three small subapical spots close together, the centre spot a little inwards. Underside very different to *subalbicans*, being uniformly blackish brown, the spots on the fore wings as above; a blackish discal band, a pale band just beyond it, even with the outer margin on both wings; internal spots as above; a dark macular submarginal band.

Expanse of wings $1\frac{6}{10}$ inch.

E. Ruwenzori, 7000' (*G. Legge*) (type in B. M.).

Celaenorhinus chinensis, nov.

♂. Antennæ brown beneath, white above, with thin brown bands; club white, with brownish tips; head, body, and wings uniform blackish brown, with an olive tint; palpi white beneath; abdomen with thin ochreous bands on the last four segments and an ochreous tip: fore wings with two large, nearly square, semihyaline white spots or patches, the first nearly filling up the end of the cell and extending right across it, the other immediately below it of the same size and shape, the two forming a band which is very slightly outwardly oblique; a small round spot outside the centre of this band, another below its outer lower edge, and a still smaller spot below this and more inwards; subapical dots and large

orange-ochreous spots on the hind wings as in *C. pyrrha*, de Nicéville; cilia of fore wings white, of hind wings ochreous.

Expanse of wings $2\frac{1}{16}$ inches.

Omei-shan, W. China (Crowley Bequest); two examples (type in B. M.).

The central white semihyaline band is more erect than in any other species of the *leucocera* group.

Celenorhinus Plötzi, nov.

♂. Dark blackish brown with an ochreous tinge; upper half of the antennæ and club ochreous on the underside: fore wings with a very broad orange-ochreous discal band, not quite touching either margin, slightly narrower towards costa, its inner margin a little before the middle of the wing and nearly straight, its outer margin somewhat roundly curved and uneven in its upper half; an orange-ochreous subapical spot: hind wings with a large orange-ochreous apical patch. Underside slightly paler; fore wings as above; hind wings without markings; palpi and face orange-ochreous; abdomen and legs below smeared with ochreous.

Expanse of wings $1\frac{5}{16}$ inch.

Bipindi, Cameroons; one example.

Allied to *C. atratus*, Mab., but quite distinct.

Abaratha siamica, nov.

♀. Pale pinkish brown, almost as pale as *A. saraya*, Doherty; palpi with some white hairs beneath: fore wings with a semihyaline white spot in the cell at one fourth, with a blackish spot on its outer side and a mark below it, this being the limit of the basal brown space; following this is a pale pinkish band of three large square spots joined together, the centre one outermost; a broken lunular spot near end of cell, a round spot below the end, a minute white spot above this, another below it, both beyond it; a little larger spot, below again and inwards, not far from the centre of the hinder margin, the usual three subapical spots: hind wings with four brownish bands of conjoined spots, with pale pinkish spaces between. Underside paler and more pinkish, the hyaline spots as above, the bands more prominent and more macular, many of the spots being disconnected; legs whitish.

Expanse of wings $1\frac{8}{16}$ inch.

Shan States, Siam (type in B. M.).

Arnetta Binghami, nov.

♂. Dark blackish brown; antennæ white at the tips and with white crook; palpi brown beneath, not white as is usual in this genus: fore wings narrower than usual; two white semihyaline spots at the end of the cell, a small lunular semihyaline mark below the end and a little beyond it, a small white spot a little beyond the upper end of the lunule, two white subapical dots: hind wings without markings. Under-side nearly as dark as above; markings of the fore wings similar, except that the two subapical dots are absent.

Expanse of wings $1\frac{1}{2}$ inch.

Tavoy Valley, Burmah (*Bingham*) (type in B. M.).

Salween Valley (*Bingham*).

Superficially looks like a *Parnara*, but has the venation and antennæ of *Arnetta*.

Telicota ternatensis, nov.

♂. Orange-ochreous, as in *palmarum*, Moore, but darker and brighter coloured; antennæ ochreous brown, with black bands and white apiculus; palpi pale ochreous, and a band of that colour between the antennæ; thorax and abdomen brown, the former with long ochreous hairs on each side: fore wings with a thin black streak on the subcostal vein and all the veins black, another on the internal vein, a dull brown band from the base to the middle under vein 2; a black oblique band containing the sexual mark quite straight to the end of the cell, then outwards below vein 6; the outer marginal band much as in *palmarum*: hind wings blackish brown, with a large ochreous spot above the middle of the centre, and a broad ochreous patch in the disk, as in *palmarum*. Under-side: fore wings with the black discal band extended hindwards, filling the basal space below the cell, and extended in a paler form along the hinder margin to the angle; the outer band is pale and has a black macular band limiting its inner margin; the hind wings are ochreous irrorated with black atoms except the spot and patch, the former has an outer black line and the latter a black macular border.

Expanse of wings $1\frac{9}{10}$ inch.

Ternate (*Wallace*) (type in B. M.).

Morotai (*Bernstein*).

This species is not unlike *palmarum*, Moore, but that insect belongs to Mabille's genus *Corone*, the species of which, though resembling *Telicota*, have no sex-mark.

Caltoris laraca, nov.

♂. Of the usual olive-brown colour; palpi below and pectus whitish: fore wings with a white diaphanous spot at upper end of cell, another obliquely below it before the lower end, a large square spot touching the lower end of the cell and a smaller equally square spot obliquely above it, its inner lower corner nearly touching the upper outer corner of the lower spot; a dot in a line beyond these two spots, and above this are the three usual subapical dots in the usual curve; a small spot in the middle of the internal vein; hind wing with two spots close together in the middle of the disk; the centre part of the fore wing is darker than the remainder of the wing, and the hind wing is broadly margined with darker brown along the costa. Underside much paler, with an ochreous suffusion; spots as above, the lower internal part of the fore wing suffused with black.

Expanse of wings $1\frac{8}{10}$ inch.

Woodlark Island (*Meek*) (type in B. M.).

Notocrypta aluensis, nov.

♂ ♀. Uniform dark black; palpi white beneath: fore wings with an outwardly curved, curiously shaped medial band composed of four spots from the middle of the costa to near the hinder margin before the angle; first spot quite small and nearly touching the costa, the second large, nearly round, the third cylindrical, its outer two thirds extending beyond the round spot, all three touching each other; the front spot small, excavated on its inner side like the letter **C** below the outer end of the third spot and slightly separated from it: hind wings unmarked; cilia black. Underside blackish brown, the band not macular; male with two white subapical dots, first near the costa, the others well separated from it and nearer the outer margin; female with a series of five subapical dots, curving outwards and then downwards.

Expanse of wings, ♂ $1\frac{6}{10}$, ♀ $1\frac{8}{10}$ inch.

Alu Islands.

Somewhat resembling *wokana*, Plots, from Aru and Ké Islands.

Ismene lusca, nov.

♀. Palpi, face, and pectus scarlet-orange, last joint of palpi brown; antennæ black; head, body, and wings olive-brown; abdomen with scarlet-orange bands on the last two segments; anal tuft similarly coloured: fore wings without

any markings whatever: hind wings with the abdominal margin from vein 2 scarlet-orange. Underside: thorax and legs with orange hairs; abdomen scarlet-orange with black bands on each side; wings paler than above, tinted with scarlet-orange; the lower part of fore wings from vein 2 whitish grey; the hind wings with the interspaces streaked with scarlet-orange, becoming more intense towards the abdominal margin, where the wing is for about one third entirely of that colour.

Expanse of wings $2\frac{4}{10}$ inches.

Maros, S. Celebes (type in B. M.).

Hasora minsona, nov.

♂. Palpi ochreous grey; eyes with a white ring round them; last joint of palpi, antennæ, head, body, and wings of a uniform olive-brown with a slight ochreous tint; frons and head tinted with blue-green; abdomen with dark brown segmental bands; wings without any markings; cilia pale greyish ochreous. Underside much paler: fore wings with the cell-space and a short transverse band beyond the cell pale and ochreous tinged; hinder margin also pale: hind wings darker, no blue reflections; anal lobe, which is restricted and blunt, with a very large blackish patch; an attenuated white band from the costa near apex to the abdominal margin above, the blackish patch, which it touches, the band broken above the patch; body greenish grey; legs ochreous grey.

Expanse of wings $2\frac{1}{10}$ inches.

Borneo; two examples (Crowley Bequest) (type in B. M.).

Hasora wortha, nov.

♂. Palpi ochreous grey, whitish at the sides; eyes ringed with white; antennæ brown, tinged with red in parts and whitish on the underside below the club; head, body, and wings olive-brown, tinged with ochreous, especially towards the base of fore wings and on the lower and abdominal portions of the hind wings; no markings; cilia ochreous grey. Underside paler; a broad darker shade on the fore wings below the cell and a discal shade: hind wings darker; a broad pale shade across the disk and on the abdominal margin; anal lobe as much restricted as in *anura*, de Nicé.; a large blackish patch on and inside of it, on the upperside of which is a small ochreous spot; body brown; legs ochreous.

Expanse of wings $2\frac{1}{10}$ inches.

Java (Crowley Bequest) (type in B. M.).

Hasora hobroa, nov.

♂. Palpi, head, and thorax green; abdomen pale brown, its basal half covered with dull green hairs; antennæ black; wings olive-brown, paling towards base with an ochreous tinge; a green patch on the costa of fore wings one third from the base; a slight greenish-grey suffusion below costa at the base; the hind wings with the basal and abdominal areas covered with greenish-grey hairs; cilia brown, with pale tips; wings without any other markings. Underside: wings paler and suffused with ochreous; fore wings with the apical and outer marginal spaces darkest; hind wings with a broad pale discal shade, the wing dark on both sides of it and merging into blackish in and above the anal lobe, which is much restricted; cilia with a white short basal line above the anal line; pectus and body grey tinged with green; legs darker green.

Expanse of wings $2\frac{2}{10}$ inches.

Celebes (type in B. M.).

The fore wings are shorter than usual and the hind wings are very deep and round, and it has no stigma.

Hasora meala, nov.

♂. Palpi below and a ring round the eyes ochreous grey; head, body, and wings olive-brown, as in *chromus*, Cram.; cilia brown; wings without markings; wings below paler and with a gloss on them; fore wings with the costa broadly smeared with blue-green above the cell, a short dark transverse shade beyond the end; hind wings with a thin, straight, transverse white band or thick line from the costa a little before the apex to the abdominal margin one fifth from the anal angle, the whole space inside this line blue-green; anal lobe damaged on both wings, but is evidently much restricted and has a blackish patch; face, pectus, and entire body brown; legs ochreous grey.

Expanse of wings $2\frac{1}{10}$ inches.

Celebes (*Wallace*) (type in B. M.).

A good and distinct species.

LXII.—*The Significance of the Pattern of the Cubs of Lions (Felis leo) and of Pumas (Felis concolor)*. By R. I. Pocock, F.L.S., F.Z.S., Superintendent of the Zoological Society's Gardens.

[Plates XIX. & XX.]

As a very general, perhaps invariable, rule, members of the cat tribe (*Felis*) that are spotted or striped when adult are

similarly spotted or striped when young—that is to say, the pattern undergoes no very marked change with growth, apart from gaining or losing in distinctness. Even when it is evanescent in the adult, such indications of it as are preserved coincide with the more clearly defined pattern of the cub or kitten. It is therefore permissible to conclude that those species in which the adult is self-coloured and the cub variegated were marked as their cubs are marked and in no other way. Hence the pattern of the cub must be treated as a specific character, and may be regarded as affording a most useful clue to affinity. Possibly, indeed, the true relationships of some of the self-coloured species of *Felis* will never be certainly ascertained until the pattern of the foetal or newly born young is known.

It is in the truth of the above-stated propositions that lie the chief interest and importance of the pattern exhibited by the cubs of lions and pumas.

It is well known that the newly born cubs of those species show a definite pattern of dark marks upon a tawny or pale brown ground-colour; but although the presence of this pattern has been cited repeatedly as evidence of the descent of the species concerned from striped or spotted ancestors, I am not aware that it has been used previously as a guide in determining their affinities with other existing forms of the genus *Felis*.

Examination of a series of skins of lion cubs shows that the pattern, which has been described sometimes as “spots,” sometimes as “stripes,” varies considerably in intensity with individuals. The meaning of this variation is unknown to me, since all the skins I have seen belong to specimens born in menageries from parents of unknown geographical origin. Sportsmen and collectors, unaware of the interest of the question, have never apparently brought skins of wild-born cubs from different localities. There are therefore no data from which an opinion can be formed as to the local constancy of the coloration of the cubs and of the value of the variation, if any, in taxonomy.

One of the best-marked examples I have seen was born at the Clifton Zoological Gardens in the spring of 1904 and is preserved in the Bristol Museum. An account of it was published* by Mr. Herbert Bolton, F.R.S.E., F.Z.S., the curator; and I am indebted to him for kindly lending me this and one other specimen for examination and description†.

* Proc. Bristol Society, (2) x. pp. 248-249 (1904).

† I have also seen other specimens in the Bristol Museum and in the Museum of the Zoological Gardens at Clifton, where they were bred.

The ground-colour is a sandy or in parts a golden yellow fading to white on the lips, the chin, the interramal area, the chest, the posterior part of the belly, and the inner side of the limbs. The underside of the tail is also whitish in the middle line; but the throat and the median part of the belly are washed with yellow. There is a conspicuous and rather large whitish patch over the inner half of the eye. The back of the ears is jet-black with a narrow edging of white. The pattern, which consists for the most part of spots, is so abundant and diffused that the interspaces look like pale stripes on a dark ground. The spots are rosette-spots like those of an ounce, an Indian leopard, or a jaguar—that is to say, they consist of a black or dusky brown more or less broken up rim surrounding an area which, though much lighter than the rim, is decidedly darker than the intervening spaces. Everywhere on the body and on the upper portion of the limbs the spots are markedly wider than the interspaces. On the upper surface of the head and along the spine the spots are more heavily pigmented than elsewhere, except on the hind leg between the knee and the hock and on the distal end of the tail, where they are as black as on the back. On the head the spots run into six rather confused and broken up longitudinal stripes, two admedians mostly blended together, which pass backwards from above the eyes on to the nape of the neck, and two laterals on each side, which converge inwards over the occiput and fuse with the admedians on the fore part of the nape. The external of these rises just above the ear on each side; the internal rises much further forwards above the inner angle of the eye. As in the chitah (*Cynailurus jubatus*), there is a patch of pigment extending downwards from the inner angle of the eye to the white of the upper lip. There is also a patch of black pigment above the outer half of the eye, and the area of the cheek behind and below the eye is clouded with black. On the sides of the neck and shoulders the pattern is obscure, but where visible the spots show indications of transverse or vertical arrangement. This transverse arrangement is very clearly expressed upon the body, especially upon its thoracic portion, where the spots are most manifestly transversely or vertically elongated and not subcircular as in leopards (*F. pardus*) and jaguars (*F. onca*), nor longitudinally elongate

Their coloration agrees substantially with that of the examples described above. None, however, are quite so heavily pigmented, though in some the tigrine nature of the pattern is equally strongly, if not more strongly, in evidence.

as in some ounces (*F. uncia*). They are, moreover, set end to end, one above the other, forming in some cases interrupted double wavy stripes from two to three inches long, extending from the median spinal line on to the belly. They might perhaps be described as transverse chains of spots comparable to the longitudinal chains of spots seen in ocelots (*F. pardalis*). The duplication of the stripes is formed by the fusion of the anterior rims of the superimposed rosettes and of the posterior rims of the rosettes, the two resulting streaks being separated by a paler area representing the fused central portions of the rosettes. In some cases these rosette-stripes extend uninterruptedly across the spine, meeting those of the opposite side at an obtuse angle and being divided from the preceding and succeeding rosette-stripes by the also uninterrupted narrow intervening strip of pale ground-colour.

On the right side of the body the fusion of the rosettes into lines is less pronounced than on the left side. On the spinal area where the rosettes are more heavily pigmented, the pale central area of each is less clearly shown than on the sides. On the sacral region and on the root of the tail the rosettes show a distinct arrangement in four longitudinal stripes, such as may be frequently seen in leopards, jaguars, and ounces. On the upper part of the thighs the arrangement of the rosettes is irregular, but on the lower and posterior parts a longitudinal arrangement with an upward angulation, such as is shown in a more emphatic manner in tigers, is noticeable. Above and below the hocks the spots are more solid and they extend on to the inner surface of the limb above the hock and halfway down the front of the leg between the hock and the paw. The paw is white and spotless. The fore legs are more tawny than the hind legs and are rather faintly rosetted from the elbow to the paw, but on the inner side below the elbow very decided indications of the brachial stripes so constant in cats are retained. The tail is spotted from the root to the tip, the spots, which are more strongly pronounced terminally, showing distinct transverse arrangement (Pl. XIX.).

The second cub, which is larger and probably older than the one just described, has the same style of pattern, but the pattern is everywhere much fainter, the backs of the ears being the only parts as heavily pigmented as in the other example. In both specimens the hair on the neck is directed backwards as in young tigers and leopards, and not forwards on the sides of the neck and forming a median cervical crest as is the case, at all events usually, in adult leopards and

tigers and also in adult lions. There are distinct signs of the whorl of hair on the shoulder*.

It seems to me that the pattern of lion cubs affords very strong support to Dr. Bonavia's view respecting the origin of the stripes of the tiger from the fusion of rosette-spots, such as are seen in Asiatic leopards, into subvertical or obliquely transverse lines. In tigers the stripes are seldom quite vertical, except upon the upper part of the shoulders and hind-quarters. On the sides of the body beneath the lumbar region they are oblique with a decided dorso-ventral inclination backwards. Moreover, they seldom form continuous streaks. Quite commonly each is broken up into three constituents, a dorsal, a medio-lateral, and a ventral, which frequently overlap at their juxtaposed extremities. The medio-laterals are often suppressed on the thoracic area behind the shoulder, as may be seen in two specimens from Nepal now living in the Zoological Society's Gardens and in a "Siberian" specimen mounted in the British Museum. It is not unusual to see one or more of the above-mentioned constituent stripes continued by a row of faint spots; or there may be rows of such small spots on the interspaces between the stripes. Quite commonly, too, one or more of the constituent stripes may be doubled in the form of a long loop. More rarely where there is a greater degree of fusion between the constituents a continuous double stripe results; and these double stripes may, I think, be truthfully compared with what may be called the rosette-stripes of lion cubs, the anterior and posterior dark rims of the rosette-stripes in the lion corresponding respectively to the anterior and posterior moieties of the double or loop-stripe in the tiger. This, I understand, is substantially Dr. Bonavia's interpretation of the origin of the pattern in the tiger. He did not, however, cite the pattern of the lion cubs in support of his hypothesis, but depended upon that of leopards or jaguars, which supply less cogent evidence in its favour, because in these species the rosettes do not fuse into stripes as they do in lion cubs†.

* On account of the erroneous belief held by some people that young lions are born with their eyes open, it may be added that the eyes in these two specimens, as in all others I have seen, are closed, as is the case, so far as I know, in all species of *Felis*.

† Although I have attempted to show that the pattern of lion cubs bears out Dr. Bonavia's views of the origin of stripes of tigers from rosette-spots such as are seen in jaguars, I do not agree with that author in believing that the pattern in *Felidae* was originally of that type. It must be admitted, I think, that Eimer was right in holding that the pattern in these animals consisted primarily of longitudinal stripes.

Another point in which the pattern of these lion cubs differs from the pattern of leopards, jaguars, and ounces, and approaches that of tigers is the following. In the three spotted species if the spots upon the spine show definite arrangement that arrangement is decidedly longitudinally linear. It is always so, I believe, more or less upon the sacral region, but less decidedly so on the lumbar and thoracic areas. In tigers, on the contrary, the upper extremities of the stripes almost invariably turn forwards on the spine, and meeting from opposite sides in the middle line at an angle form a series of Λ -shaped figures, a corresponding shape being naturally assumed by the intervening spaces. In the lion cub above described a similar pattern is quite clearly indicated in certain places, the spine being crossed from right to left by broad irregular Λ -shaped blotchy stripes separated by narrower interspaces of a golden-tawny hue. In tigers, of course, the interspaces are wider than the stripes, the converse being true of the lion. This circumstance is quite in keeping with the theory that the narrow stripes of the tiger resulted from the antero-posterior compression of the broader rosette-stripes such as are seen in young lions.

On the tail and lower half of the thigh, as stated above, the disposition of the spots in the lion cub also foreshadows the stripes of these regions seen in tigers, but not seen, or not nearly so clearly seen, in leopards, jaguars, and ounces.

Another truly tigrine feature is the presence of a white patch over each eye. This is a feature in which the lion cub differs not only from adult leopards, jaguars, and ounces, but also from adult lions.

If there is any truth in the above-stated assumption as to the origin of the tiger's pattern and also in the claim that the pattern of the lion cub is nearly intermediate in character between that of the leopard and that of the tiger—and I can see no strong argument against either,—it appears to me to be necessary to conclude that these three species of *Felis* are nearly related forms, a conclusion by no means obvious when the coloration of the adults alone is considered. It was largely no doubt owing to the differences in the coloration of the adults that each of these species has been referred to a distinct subgenus of the genus *Felis*.

I have elsewhere * pointed out that the prevalent belief in near affinity between leopards and jaguars, so forcibly suggested by their patterns, is confirmed by the resemblance

* P. Z. S. 1907, p. 677 (Oct.).

between the roars of the two species; and as an additional argument in favour of the view that lions and tigers are related, it may be urged that the roar of a tiger is sufficiently like that of a lion to be easily mistaken by those who have never noted the differences between the two sounds. The differences, of course, are obvious, but the similarity is also unmistakable. The roar of the tiger, in fact, is much more like the roar of the lion than it is like the roar of any other species of *Felis* that I have heard.

It is, in my opinion, quite evident that too much importance has been attached by earlier authors to *absence* of pattern in adult examples of some species of *Felis*. The lion and the puma, for example, are suggestively juxtaposed both in Jardine's monograph of this group, published in 1834, and in that of Dr. Elliot, published in 1883; and Trouessart, even as lately as 1904, kept the puma and the lion in the same subgenus. But if appeal be made to the primary pattern of these two species, as shown by the cubs, and not to the secondary coloration of the adult, which is probably of comparatively recent origin, very little support will be found for the view that the two are nearly related forms.

I have only had the opportunity of examining the skins of two newly born puma cubs, one in the collection of the Zoological Society of London, the other in the Museum of the Zoological Gardens at Clifton. Although the pattern of the two is in the main identical, they differ in certain respects so markedly from each other that it is probable that one or both of the parents of the one were specifically or subspecifically distinct from one or both of the parents of the other *.

In the Zoological Society's specimen (Pl. XX.) the ground-colour is a brownish fawn, fading to white on the underside and on the inner side of the limbs. There is white above the eyes, on the upper lip, lower lip, and chin, the cheek below the post-ocular stripe being a dirty white. The sides and top of the muzzle are dark brown, and both the front and hind legs from the elbow and hock to the tips of the toes are also dark brown and without spots. On the side of the head a black stripe extends backwards from the corner of the eye beneath the ear, where it expands into a large dark patch. Above the inner corner of each eye a black stripe runs backwards on to the summit of the head, and between these are two narrower stripes. On the head these four stripes apparently become zigzagged and more or less broken up.

* The puma (*F. concolor*) of the older authors has been divided into a number of species and subspecies of late years. It would be extremely interesting to know what the cubs of all these forms are like.

Unfortunately the hair on the posterior part of the head and the anterior part of the nape is rubbed off, so it is impossible to say for certain that the stripes extended right over this region. That they probably did so, however, is attested by the presence of four cervical stripes upon the posterior area of the nape. The admedians of these, though narrow and faint, can be traced on to the middle line between the shoulders. The externals, on the other hand, are broad and very distinct, the one on the right side being continued by a well-marked suprascapular stripe, a stripe which is persistent in so many of the smaller species of the genus *Felis*. On the sides of the neck outside the external cervical stripe there are some darker and fainter elongated spots or abbreviated stripes running downwards towards the throat and chest. On the shoulders below the suprascapular stripe there is also a large transversely elongated spot, and below this some smaller spots which become lost in the fuscous tint of the fore leg. On the lumbar and sacral regions of the body there are three very definite rows of large spots showing a decided tendency to coalesce into longitudinal stripes. On the sides of the body below the external of these (the dorso-lateral stripe) there are about three rows of large spots of irregular shape and sometimes more or less fused, especially on the abdominal region, where they tend to run into short zigzag abbreviated stripes. The thighs are spotted like the sides of the body. On the thoracic region, both dorsally and laterally, the spots are less symmetrically arranged than upon the abdominal region, and the posterior part of the thoracic region is marked dorsally with a pair of very large abbreviated stripes, representing two or three fused spots, and inclining obliquely backwards from a point close to the median dorsal line. The greater part of the tail is lost; but the one inch of its basal portion which persists exhibits a large dorsal spot.

The spots are all solid and of nearly uniform intensity.

The example in the Museum of the Clifton Zoological Society differs from the one above described principally in the complete absence of spots and stripes from the top of the head and the nape of the neck, in the tawny hue of the legs, and in the noticeably fainter tint of the spots on the sides of the body as compared with those of the dorsal area. On the head there is a short stripe above the inner corner of the eye, a narrow stripe descending backwards from the outer corner of the eye beneath the ear, and a brown patch above the corner of the mouth. The back of the ear is jet-black. Extending along the dorsal area from the shoulder to the root of the tail there are three rows of solid spots, those of the median or spinal row forming a more definite

line than those of the lateral row, which are about nine in number on each side. Below the latter the spots form roughly about three rows, but their arrangement is not obviously either vertical or longitudinal. On the shoulders the spots tend to run into abbreviated transverse bars; at least, on to the root of the tail the median spinal stripe extends. It expands along the tail into triangular blotches constituting transverse bars, about eight in number; the tip of the tail is black. The legs are practically without spots.

Broadly speaking, the pattern of the two specimens of puma described above agrees with that of the examples depicted in pl. ii. of Elliot's 'Monograph of the Felidæ.'

In the large size and small number of the spots, in their solidity and definite arrangement in three rather widely separated lines along the back, or, at least, along its lumbo-sacral area, in the nature of the markings on the tail, on the shoulders, and on the nape of the neck, when they persist there, the pattern of the puma is quite different from that of lions, leopards, jaguars, and ounces. On the evidence supplied by the pattern, the puma cannot, I think, be regarded as nearly related to any one of those species. Nor do I know of any special point, apart from size, in which the puma resembles the three spotted species just mentioned, while practically the only likeness he presents to the lion is the adult coloration, which must be set aside as a valueless criterion of relationship.

It is a very difficult matter to decide to which group of species of the genus *Felis* the puma is really related. The pattern is not like that of any existing form; but in the characters above enumerated, in which it differs from the pattern of leopards and lions, it approaches the pattern of several of the smaller species of the genus, species in which the pattern is, in my opinion, of a more primitive type than it is in the giants of the family.

I can find nothing in the structure of the skulls opposed to the view here put forward, that the puma cannot be associated with the group comprising tigers, lions, jaguars, leopards, and probably ounces, nor anything in disaccord with the suggestion that its nearest allies must be sought amongst some of the smaller species. Rather the contrary. And I do not think the resemblance between pumas and "domestic cats" in the ossification of the hyoidean suspensorium and in the expression of friendly feeling by "purring" should be altogether lost sight of in future discussions of the subject*.

* In lions, tigers, and leopards, according to Mivart, the suspensorium is ligamentous. These species do not "purrr."

Summary.

1. The patterns of the cubs of lions and pumas are specific characters. These species, usually described as uniformly coloured, were formerly marked as their cubs are marked and in no other way.
2. The pattern of lion cubs is intermediate between the spotted pattern of leopards or jaguars and the striped pattern of tigers.
3. From this it may be inferred that leopards (including jaguars), lions, and tigers are nearly related one to another.
4. On the assumption that spots preceded transverse stripes in evolution, it may also be inferred that the stripes of tigers originated from the fusion of rosettes into transverse chains, as Dr. Bonavia maintained.
5. The pattern of puma cubs affords no support to the belief that pumas are nearly allied either to leopards or lions.
6. Rather, in my opinion, does the pattern of puma cubs suggest that pumas may be regarded as large self-coloured representatives of one of the groups of smaller species of *Felis*, in the same way that lions may be regarded as large and otherwise modified representatives of a group exemplified by leopards.

EXPLANATION OF THE PLATES.

PLATE XIX.

Copy of a photograph of the dorsal view of a mounted lion cub in the collection of the Bristol Museum, showing the formation of transverse stripes from rosettes and attesting the relationship between lions and leopards on the one hand, and lions and tigers on the other.

PLATE XX.

Drawing of the flat skin of a newly born puma cub in the collection of the Zoological Society of London. The unshaded area on the fore part of the neck shows where the hair has been rubbed away. Since the tail was absent from this skin, the drawing of that organ was copied from the example in the Museum of the Clifton Zoological Gardens.

LXIII.—*Descriptions and Records of Bees*.—XVII.

By T. D. A. COCKERELL, University of Colorado.

Osmia fulgida, Cresson, 1864.

THIS species was described from the female. Mr. S. A. Rohwer collected five males at Florissant, Colorado, June 15 to July 6, 1907; one was at flowers of *Erigeron*. The male is about 9 mm. long, very bright green, the abdomen shining;

form very slender, with the abdomen long and parallel-sided; pubescence white throughout; scape green; flagellum long and slender, ferruginous, darkened above; apical dorsal segment concave above, its apex broadly snout-like, not at all notched; a small spine on each side of the penultimate segment.

Var. *a*.—Hind margins of abdominal segments narrowly brilliant purple; vertex suffusedly crimson and golden. One specimen, July 6.

By the narrow form and the structure of the abdomen, this species is allied to *Monumetha*, but the antennæ are normal for *Osmia*.

Osmia pentstemonis, Ckll., 1906.

Var. *a*. ♀.—Light hair of thorax strongly yellowish. Florissant, Colorado, at flowers of *Besseyia plantaginea*, June 1, 1907 (*S. A. Rohwer*).

Osmia physariae, sp. n.

♂.—Length about $8\frac{1}{2}$ mm.

Blue-green, shining; head and thorax with copious long hair, which is faintly yellowish dorsally, but otherwise white, *with no dark hairs intermixed*; flagellum dark reddish and *very strongly crenulate beneath*; legs black, not at all metallic, their hair white, last tarsal joint ferruginous; form of tarsi normal; tegulæ piceous with a large green spot. Wings hyaline, a little dusky, but not at all reddish; b. n. meeting t.-m. Abdomen subglobose, with abundant dull white hair, which tends to form marginal bands; *sixth dorsal segment perfectly entire*; seventh bidentate; first ventral entire.

In the Florissant table of *Osmia* (Bull. Am. Mus. Nat. Hist. 1906) this runs to *O. faceta*, but that is very different by the black hair on the abdomen. In the Boulder County table (Univ. of Colo. Studies, 1907) it runs to *O. proxima*, but that is a smaller and otherwise different species. The antennæ suggest *O. chlorops*, but the flagellum is shorter, and the hind tarsi are different; the wings also are differently coloured.

Hab. Florissant, Colorado, at flowers of *Physaria*, June 1, 1907 (*S. A. Rohwer*).

Osmia seneciophila, sp. n.

♂.—Length 9 mm.

Head and thorax very dark dull blue, a little greenish on scutellum; abdomen shining indigo-blue, closely punctured; hair of head and thorax white; hair of cheeks white, except just behind the eyes, where it is long and black; extreme sides of vertex with a few black hairs, and even a very few

on front; flagellum long, dark, submoniliform; legs black, not metallic, their hair partly black and partly pale; tarsi normal, but the last joint red and rather elongate. Wings hyaline, a little stained along the veins. Abdomen subglobose, hind margins of segments very narrowly reddish; third and following segments with short black hair; sixth with a small notch; seventh bidentate; first ventral normal; *third ventral with a semicircle of long pale orange hairs in the median emargination*; fourth broadly elevated in the middle, the long margin of the elevation ciliate with black hairs.

In the Florissant table runs to *O. faceta*, and it agrees with certain Rocky Mountain males which I have called *faceta*; but the real *faceta* is a steel-blue insect allied to *O. chalybea*. In the Boulder County table it runs to *O. aprilina*, which is, however, a smaller species, with the hair a different colour and the flagellum not submoniliform. Disregarding the few black hairs at sides of vertex, it runs to *Wheeleri* and *cyaneonitens*. *O. Wheeleri* is easily separated from it by the absence of the peculiar characters of the third and fourth ventral segments, as well as the narrower form and different colour of the abdomen; *O. cyaneonitens* is considerably larger, and also lacks the semicircle of orange hairs on the under side of the abdomen.

Hab. Florissant, Colorado (type-locality), at flowers of *Senecio tridenticulata*, June 26 (*S. A. Rohwer*). Top of Las Vegas Range, New Mexico, 11,000 ft., June 28 (*Cockerell*).

Osmia amala, sp. n.*

♂.—Length about 9 mm.

Head and thorax very densely punctured, but glittering, dark blue, giving way to green on clypeus and mesothorax; abdomen broad-ovate, brilliant purple-blue, the hind margins of the segments narrowly rufous; legs black, without metallic tints; hair of head and thorax dull white, with no dark intermixed on thorax above; hair of cheeks black, and a few black hairs on extreme sides of vertex; hair on pleura white, but just under the wings, and posteriorly on sides of metathorax, it is black; clypeus normal; antennæ wholly dark, flagellum very long, not at all crenulate or moniliform. Wings hyaline; b. n. meeting t.-m. Hair of legs partly pale and partly dark; hind femora with scattered black hairs; hair on inner side of hind basitarsus very dark purplish fuscous. Sixth dorsal segment of abdomen entire, not at all produced; seventh bidentate, with a brush of black hair beneath each tooth; first ventral not emarginate; second

* *Amala*, a Malayan word for blue.

ventral and sides of third with fringes of long black hair ; emargination of third with short whitish hair.

In the Florissant table runs to *O. faceta*, but differs by the non-moniliform antennæ and other characters. In the Boulder County table runs to *O. viridior*, but is much smaller and of a different colour. Disregarding the few black hairs at sides of vertex, it runs to *O. Wheeleri*, which it closely resembles ; but it is easily known from *Wheeleri* by the black hair at sides of metathorax, structure of apex of abdomen, &c. The first two small joints of the middle tarsi are swollen, as in *O. universitatis* and *integrella*: *universitatis* has the hair on the sides of the metathorax light and the abdomen greenish ; *integrella* is considerably larger than *amala* and the abdomen is of a very different colour. In size and the colour of the abdomen *O. amala* resembles *O. coloradella*.

Hab. Florissant, Colorado, June 30, 1907 (*S. A. Rohwer*).

Osmia mertensiae, sp. n.

♂.—Length about 8 mm.

Head and thorax green, glittering ; abdomen deep blue-green, very shiny, the hind margins of the segments concolorous ; legs strongly tinged with green ; hair of head and thorax long and white ; no dark hairs on thorax, but a few long dark hairs on anterior part of cheeks ; hair of legs pale, with some black intermixed ; hair of hind femora partly pale and partly dark ; clypeus normal, covered with a dense brush of hair ; flagellum only moderately long, not at all moniliform, ferruginous beneath ; wings strongly dusky ; tarsi normal. Abdomen with short black hair beyond second segment ; sixth notched ; seventh bidentate ; venter normal.

In the Florissant table runs to *O. Wheeleri*, of which it may possibly be a variety, but the antennæ are differently coloured, and the sixth abdominal segment is only feebly notched, and does not bulge at the sides as it does in *Wheeleri*. In the Boulder County table it runs to *O. aprilina*, but that has the pubescence, antennæ, &c. quite different. The vertex of *mertensiae* not only shows some black hairs at the sides, but there are black hairs about the ocelli.

Hab. Florissant, Colorado, at flowers of *Mertensia lanceolata*, June 19, 1907 (*S. A. Rohwer*).

Osmia enena, sp. n.*

♂.—Length about 9 mm.

Dark blue. Superficially similar to *O. mertensiae*, but differing thus : antennæ considerably longer, the flagellum

* *Enena*, a Malay word meaning small.

faintly brownish beneath, but quite dark; legs not metallic; abdomen narrower and less shining; marginal cell longer and narrower apically. The head is rather large; there are dark hairs about the ocelli; the thorax is wholly without dark hair. There is a dark stain at the apex of the marginal cell. Notch in sixth abdominal segment strong.

In the Florissant table it runs to *O. faceta*, but differs in the antennæ, &c. Compared with *O. Wheeleri*, the abdomen is duller and the sixth segment differently shaped. The clypeus is practically black; in *Wheeleri* it is blue-green. In the Boulder County table, *O. enena* runs to *aprilina*, from which it differs in the form of the abdomen, the colour of the pubescence, &c.

Hab. Florissant, Colorado, June 23, 1907 (*S. A. Rohwer*).

Osmia vallicola, sp. n.

♂.—Length about 8 mm.

Superficially similar to *O. mertensiae*, but smaller, with the flagellum wholly dark, the apical tooth of mandibles longer, the head and thorax greenish blue; the vertex, front, and thorax above with scattered very long black hairs; upper part of pleura with the hair black; marginal cell longer; second submarginal cell very long. The legs are strongly metallic; the abdomen is very shiny, and of the same tint as that of *mertensiae*; sixth segment rather feebly notched; venter and tarsi normal.

In the Florissant table runs to 3, and runs out because of hair of pleura half black and half light. In the Boulder County table it runs to *O. propinqua*, but the flagellum is not moniliform, and there are many other differences. (*O. propinqua* does occur at Florissant, both sexes having been taken by Mr. Rohwer from flowers of *Salix brachycarpa*, June 11, 1907.)

Hab. Florissant, Colorado, at flowers of *Ribes vallicola*, June 11, 1907 (*S. A. Rohwer*).

Osmia nigrifrons, Cresson, 1878.

Three females at flowers of *Senecio tridenticulatus*, Florissant, Colo., June 14, 1907 (*S. A. Rohwer*).

Osmia Wheeleri, Ckll., 1906.

One male at flowers of *Castilleja integra*, Florissant, Colo., June 23, 1907 (*S. A. Rohwer*).

Osmia florissanticola, Ckll., 1906.

Two females at flowers of *Aragallus Lamberti* (sens. lat.), Florissant, Colo., June 1907 (*T. D. A. Cockerell*).

Osmia subtrevoris, Ckll., 1906.

Florissant, Colo., June 16, 1907 (*S. A. Rohwer*).

Sphecodes (Machæris) Rohweri, sp. n.

♀.—Length a little over 5 mm.

Head and thorax black, shining, with white hair, *which is not at all infuscated dorsally*; head transverse, front very densely punctured, flagellum thick, testaceous beneath; mandibles simple, ferruginous except at extreme base; disk of mesothorax with strong punctures, *about as close though perhaps not quite so large as in S. Cressonii* (the thorax itself is smaller than in *Cressonii*, and not quite the same tint, appearing a sort of blue-black by contrast); area of metathorax semilunar, well defined, *with strong radiating ridges*; tegulae rufo-testaceous; *wings dusky reddish*; tarsi dark brown, with glittering hairs. Abdomen shining, of a yellower red than that of *S. eustictus*, the red including only the first three segments (but these without black), the fourth and following black; second and third segments punctured basally.

Close to *S. stygius*, Rob., from Illinois, but separable by the characters italicised.

Hab. Florissant, Colorado, at flowers of *Salix brachycarpa*, July 7, 1907 (*S. A. Rohwer*). Mr. Rohwer also took *Proteraner rhois*, Ckll., and *Sphecodes Sophiae*, Ckll., at the flowers of the same species of *Salix*, at Florissant, the first June 2, the second June 6.

While on the subject of *Sphecodes*, I take the opportunity to offer a table of the larger species more or less like *S. dichrous*. Many of these are very much alike superficially, and are not easy to recognize without a table. The table is based on females.

When the abdomen is looked at from the side, a strong constriction is seen dorsally at the base of the second segment; punctures of mesothorax strong and dense; area with strong longitudinal ridges

pecosensis, Ckll.

When the abdomen is looked at from the side, the constriction is seen to be feeble or absent

- | | |
|---|----|
| 1. First abdominal segment with a blackish discal spot; disk of mesothorax shining, with the punctures widely separated .. | 1. |
| First abdominal segment without a blackish discal spot | 2. |
| 2. Area of metathorax with widely separated longitudinal ridges and a few cross ones; abdomen distinctly but not at all closely | 3. |

- punctured, first segment very sparsely punctured..... *dichrous*, Smith.
- Area subcancellate with irregular wrinkles (male abdomen largely red) *hesperellus*, Ckll.
3. First abdominal segment with the apical half very distinctly and rather closely punctured; area irregularly wrinkled; mesothorax rather more densely punctured than in *dichrous*; abdomen broad, the apex hardly at all blackish..... *arvensis*, Patt., Rob.
- First abdominal segment with very sparse (sometimes hardly any) punctures 4.
4. Second abdominal segment, beyond the base, with very fine, relatively close, regular punctures 5.
- Second abdominal segment, beyond the base, with very sparse punctures 6.
5. Abdomen broad, chestnut colour; wings very dark and very yellow..... *arvensiformis*, Ckll.
- Abdomen narrower, paler, the last segment blackened; wings hyaline, the apical half smoky, but not yellowish; aspect of *S. columbiæ* *lautus*, Lovell & Ckll.
6. Apex of abdomen broadly blackish..... 7.
- Apex scarcely or not blackish 8.
7. Larger; mesothorax very shiny; wings hyaline *olympicus*, Ckll.
- Smaller; mesothorax duller; wings with a strong reddish suffusion *obscurans*, Lovell & Ckll.
8. Face with a little white hair, but principally coarse black bristles; abdomen long and pale; mesothorax densely punctured, the posterior middle sparsely *columbiæ*, Ckll.
- Face with hoary white hair 9.
9. Mesothorax smaller, very shiny, less densely punctured, the median sulcus evident *arroyanus*, Ckll.
- Mesothorax larger, duller, more densely punctured, the median sulcus not or hardly evident *persimilis*, Lovell & Ckll.

The three species of Lovell and Cockerell are from Maine, and are described in a paper which has been sent to 'Psyche' for publication.

Halictus scrophulariæ, Ckll., 1906.

Mr. S. A. Rohwer took 17 females at Florissant in June 1907; of these, 15 were at flowers of *Salix brachycarpa*, one at *Ribes vallicola*, and one at *Taraxacum taraxacum*. The thorax varies from blue-green to brassy green.

Andrena Porteræ, Ckll., 1900.

Florissant, 7 females, June 16, 1907 (S. A. Rohwer). Five were at *Ribes longiflorum* *, two at *R. pumilum*.

* The mountain form of *R. longiflorum* is *R. leiobotrys*, Kœhne, as I learn from Dr. N. L. Britton. I understand that it will be regarded as distinct in a forthcoming part of 'North American Flora.'

MISCELLANEOUS.

Echinocrinus versus *Archæocidaris*.

By F. A. BATHER, British Museum (Nat. Hist.).

AMONG many preliminary studies for a memoir entitled "Triassic Echinoderms of Bakony" *, now passing through the press, I had to make up my mind on this long-vexed question. My friend Professor R. T. Jackson had to do the same for a forthcoming memoir on Palæozoic Echinoids, and on his asking my opinion I sent him the MS. of the present note. Had he not urged its publication, so as to clear the ground, I should have preferred to let someone else play this ungrateful rôle of nomenclatural *chiffonnier*.

The name *Echinocrinus* was proposed by Agassiz (1841, "Obs. sur les progrès récents de l'hist. nat. des Echinodermes," Monogr. d'Echinodermes, ii. p. 15) for *Cidaris Urvii* Fleming, and *Cidarites Nerei*, *Protei* et *priscus* of Münster, and some unpublished species. The genus was thought by him to be a crinoid precursor of Echinoidea, possessing "la forme sphéroïdale des oursins avec des ambulacres étroits et de longs piquans épineux comme certains *Cidaris*," and "circonscrit dans les terrains de transition et dans les terrains houillers." On p. 20 Agassiz mentioned a new species of *Echinocrinus* sent to him by Austin.

According to modern rules and customs it is clear that the name *Echinocrinus*, unless preoccupied, which has never been maintained †, is perfectly valid, and that one of the four species mentioned by name must be taken as genotype.

T. & T. Austin (1842, Ann. Nat. Hist. x. p. 111, Oct.) accepted the name *Echinocrinus*, and mentioned under it *E. pomum*, *E. spinosus*, *E. anceps*, and *E. cidariformis*? The last three were their own MS. species, while the first, ascribed to Agassiz, doubtless referred to the specimen above mentioned as sent by Austin to Agassiz, and was also still in MS. Consequently, except as showing that the name was accepted, this paper has no bearing on the interpretation of the genus.

The species *E. spinosus* and *E. anceps* were described by the Austins in March 1843 (Ann. Nat. Hist. xi. p. 207), but not in such a way as to permit of their recognition, while they did not state their horizon. The latter was compared with *E. pomum*, which, however, remained undescribed. Here occurs the first objection to the generic name: "It appears to us," they wrote, "that the name of our genus *Sycocrinites* and that of the *Echinocrinus* of Professor Agassiz require amendment, as their terminations imply affinities which do not exist." The meaning of this is not very clear, since by the title of their paper they still retained them under Crinoidea, and since by the words "Column unknown" they

* 'Resultate der wissenschaftl. Erforschung des Balatonsees,' i. Bd. 1 Th., Pal. Anb.

† *Echinoencrinus*, H. v. Meyer, 1826, is unfortunately similar, but it is far from identical.

implied that both genera were at any rate *Pelmatozoa*. Unpublished drawings by the Austins of some of their species of *Sycocrinites* have convinced me that those species were Crinoids after all. The criticism, therefore, was not at that time well founded.

In 1844 the name *Echinocrinus* was still maintained by no less a person than M'Coy ('Synops. Carb. Foss. Ireland'*, p. 173), who then gave a systematic diagnosis, recognizing the genus as an Echinoid, and distinguishing it from *Palorchinus* on the one hand and *Cidaris* on the other. Under this name he proceeded to describe *E. Munsterianus*? (Kon.), *E. glabrispina* (Phill.), *E. triserialis* sp. n., *E. Urii* (Flem., incl. *Cidaris benburbiensis* Portlock), and *E. vetustus* (Phill.). Now, if by chance any objection were raised to *Echinocrinus* Agassiz, on the ground of insufficient or misleading description, and if the Austins' use of the name were ignored on similar grounds, the objector would still be compelled to accept the name as here confirmed by M'Coy; and since all the species described by M'Coy were based on radioles only, with the exception of *E. Urii*, that species would naturally be selected as genotype, just as it would in the case of Agassiz' name †. So far the situation is unchanged. M'Coy, however, took the unfortunate step of mentioning that he "had long‡ ago distinguished this species in" his "MSS. under the name of *Archæocidaris*." Obviously this casual remark could not give any sanction to the name *Archæocidaris*, nor was it intended to do so. On the contrary, it is a question whether this mention did not put the name out of court at once and for ever as a mere homonym of *Echinocrinus* §.

Once these fossils were clearly understood to be Echinoids and unrelated to Crinoids the obvious appropriateness of M'Coy's MS. name led to its adoption by some authors. Thus, in 1845, Murchison, Verneuil, and Keyserling ('Geol. Russia,' ii. pp. xiv & 396), in assigning *Cidaris rossicus* Buch, to the newly established genus, asserted their preference for the name *Archæocidaris*. Nowhere in the volume, however, is this species called anything but *Cidaris* (or *Cidarites*) *rossicus*. It would, therefore, scarcely be possible to regard the name *Archæocidaris* as given any standing by those authors; nor, if occasion arose, could it be restricted on these grounds to any genus that might be established with *C. rossicus* as

* I am aware that, strictly speaking, this work was first published in 1862 by Messrs. Williams and Norgate; but many copies were privately distributed by Sir Richard Griffith towards the close of 1844 and subsequently. Desor, however, had not yet seen it in 1857.

† If anyone were to insist on the first species mentioned being taken as the genotype, he would select *E. Urii* if he accepted Agassiz, but *E. glabrispina* if he accepted only M'Coy. *E. Munsterianus* being marked with a ? could not be selected.

‡ None the less in 1842 he called this species merely *Cidaris Urii*. See R. [J.] Griffith, 'Notice respecting the Fossils of the Mountain Limestone of Ireland &c.,' p. 12: printed Dublin, 1842.

§ In the legend to the lithographed plates the name *Archæocidaris*, which had been printed, was erased, and the name *Echinocrinus* inserted by hand.

genotype. Admittedly the name remains a pure homonym of *Echinocrinus*.

That the view just expressed was the one at that time adopted by a man of sane judgment is proved by Bronn's "Index Palæontologicus" ('Nomenclator,' p. 443; 1848), where *Echinocrinus* is definitely accepted with *Archæocidaris* as a synonym. To this genus Bronn refers all the species hitherto mentioned, except MS. names and except *E. triserialis* M'Coy, while he adds *Cidaris deucalionis* Eichw. as a possible synonym of *E. rossicus*.

In November 1846, however, Desor, in Agassiz & Desor ("Cat. raisonnée des Ech.," Ann. Sci. Nat. (3) vi. p. 340) founded the genus *Palæocidaris* for the *Cidaris Nerei*, *Protei*, and *prisca* of Münster, previously placed by Agassiz in *Echinocrinus*. That the intention was simply to supplant the name *Echinocrinus* by one more appropriate to the echinoid nature of the fossils, appears from a note in Desor's 'Synopsis' (p. 154), as well as from the omission of *Echinocrinus* from the 'Catalogue.' Since, however, no such statement was made at the time, it might be possible to assign to *Echinocrinus* the genotype *Cidaris Urii*, and to *Palæocidaris* the genotype *Cidaris Nerei*, and ultimately, should subdivision of genera proceed on these lines, to use both names. Down to this present, however, no writer has doubted that *C. Nerei* and *C. Urii* are congeneric, and *Palæocidaris* must therefore be regarded as either a homonym or a synonym of *Echinocrinus*.

The name *Palæocidaris* was no doubt proposed in ignorance of M'Coy's name *Archæocidaris*, and M'Coy (1849, Ann. Nat. Hist. (2) iii. p. 252) rightly pointed out that, if *Echinocrinus* were to give place on any grounds to a later name, then *Archæocidaris* was prior to *Palæocidaris*; and this view was accepted by Desor (1857, 'Synopsis,' p. 154). M'Coy's reasons for reversing his own previous action were thus expressed:—(1) "Agassiz neither indicated the affinities nor gave any descriptive notice of the genus *Echinocrinus*, while I have done both for my *Archæocidaris*." (2) "Several of the continental geologists have not followed my example in rejecting my own name, but prefer *Archæocidaris*." (3) Agassiz and Desor, as above mentioned, have given up Agassiz' own name. Of these reasons the only one that could have any validity is the first; but the statement is not entirely correct, since Agassiz did indicate what, in his opinion, were the affinities of *Echinocrinus*, and he did give a descriptive notice two lines long. The incorrectness of his opinion and the insufficiency of his notice were fully compensated for by his mention of four well-known species. No contemporary worker failed to understand precisely what Agassiz meant by *Echinocrinus*. That the name accords ill with present knowledge may be admitted, but it is no more misleading than M'Coy's own name *Codaster*, proposed in the very same paper for a fossil "obviously allied to *Pentremites*," or than *Agelacrinus* for an Edriasteroid, or *Phrissocystis* for an Echinoid. As for the "several continental geologists" of M'Coy's paragraph (2), I have been unable to discover them; but it may be added that d'Orbigny

(1850, 'Prodrome,' i. p. 154) adopted *Echinocrinus* with *Palæocidaris* as a synonym, and left *Archæocidaris* out of consideration, presumably as a mere MS. name.

Thus far, then, the result of our examination is to reinstate *Echinocrinus* Agassiz, with *Archæocidaris* as a pure homonym and *Palæocidaris* as a synonym. The name *Archæocidaridæ* will also have to go. There remain for consideration various attempts at subdividing the original genus *Echinocrinus*, or the relegation of certain species to other genera.

Desor (1857, 'Synopsis,' p. 155) distinguished a new genus *Eocidaris* from *Archæocidaris* (i. e. *Echinocrinus*) on the ground that the primary tubercles of the interambulacra were devoid of a halo ("second anneau"), and he included in this genus, *inter alia*, *E. Verneuilana* (King), *E. rossica* (Buch), and *E. Munsteriana* (Kon.), all species which had at one time been referred to *Echinocrinus* or *Archæocidaris*.

To the interpretation of *Eocidaris* I shall ask permission to recur in a subsequent note, and confine myself here to pointing out that the result of Desor's action at any rate was to restrict *Echinocrinus* to species with primary interambulacral tubercles perforate, non-crenulate, scrobiculate, and, above all, annulate (i. e. with a "basal terrace").

The next step appears to have been that taken by Meek and Worthen (1869, Proc. Acad. Nat. Sci. Philadelphia), who, after describing *Eocidaris? squamosa* (p. 79), showed its distinction from *Archæocidaris* and *Eocidaris*, and tentatively proposed the name *Lepidocidaris* (p. 81). This resembles *Eocidaris* in the absence of a basal terrace from the interambulacral primary tubercles, but is presumed to differ from it in the presence of eight columns of interambulacra at the ambitus and demiplates alternating with primary ambulacra. The structure of these parts in *Eocidaris* is still unknown; but the genus *Lepidocidaris* has been generally accepted (see Jackson, 1896, p. 220; and Tornquist, 1897, pp. 51=773).

In 1883 Pomel ('Class. Méth.' p. 113) erected the genus *Cidarotropus*, with genotype *Archæocidaris Wortheni* Hall. Pomel drew no distinction between the interambulacral plates, but based the genus on the two series of regular primary ambulacra, each with two pores in the middle of it. Our knowledge of these structures in the original species of *Echinocrinus* is not enough to warrant a distinction on these grounds.

Tornquist, however (1897*, pp. 52=774), has divided the species into two main groups. That including the genotype *E. Urii*, together with *E. Nerei*, *E. Wervecki*, and *E. Grueneri*, possesses interambulacra with a clear basal terrace from which thick wedge-shaped ridges radiate to the margin of the plate. The other group, which includes *E. rossicus*, *E. Trautscholdi*, *E. Wortheni*, *E. biangulatus*, *E. megastylus*, and *E. Norwoodi*, has interambulacra with a basal terrace well developed on some, but sometimes entirely absent

* "Das fossilführende Untercarbon &c.," Abh. geol. Karte Elsass, v.

from others, with smooth scrobicule around which are numerous small scrobicular tubercles in one or more circles; these tubercles are usually especially numerous on the adoral and adapical margins, particularly the latter, where they form many close-serried rows.

E. Munsterianus is, according to Tornquist, the representative of yet a third group, the characters of which he does not give. Does he know more of it than the radioles?

Tornquist has given no generic or subgeneric names to the groups defined by him, but Lambert (1900 *, p. 42), while retaining for the first group the name *Echinocrinus* (in accordance with the views above expressed), has suggested the resuscitation of *Archæocidaris* for the second group. This, of course, is quite inadmissible, as already explained (p. 453). If a name be required, "*Cidarotropus*" is ready to hand, with genotype *C. Wortheni*. But it is really too early to make this division. Unfortunately so many species have been based on radioles or on isolated interambulacral plates that they cannot be referred with any security to either of these groups. Perhaps we may be allowed to retain the word "*Archæocidaris*" as a convenient appellation for such doubtful cases, much as the word "*Ammonites*" still has its uses.

The following statement summarizes the conclusions with regard to the principal generic names mentioned in this study:—

ECHINOCRINUS Agassiz, 1841.

Genotype *Cidaris Urii* Fleming.

Syn. *Archæocidaris*, M'Coy, MS., 1844.

Palæocidaris, Desor, 1846.

Archæocidaris, M'Coy, 1849.

CIDAROTROPUS Pomel, 1883.

Genotype *Archæocidaris Wortheni* Hall.

Syn. *Eocidaris* Desor (pars), 1857.

Archæocidaris Lambert (non M'Coy), 1900.

LEPIDOCIDARIS Meek & Worthen, 1869, em. Jackson, 1896.

Genotype *Eocidaris? squamosa* Meek & Worthen, 1869.

Of these genera, *Echinocrinus* and *Lepidocidaris* are well established, but *Cidarotropus* rests, for the present at any rate, on an insecure basis, and, if not accepted, must with its synonyms be added to the list of synonyms of *Echinocrinus*.

The choice of a name to replace *Archæocidaridæ* is therefore limited to two. *Echinocrinidæ*, the natural successor, does not suggest the systematic position of the Family so well as *LEPIDOCIDARIDÆ*, and I therefore propose to use the latter.

* "Étude sur quelques Échin. de l'Infra-Lias &c.," Bull. Soc. Sci. Yonne, liii. 1^{er} semestre, pt. 2.

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LXIV.—*A Revision of the Medusæ belonging to the Family Laodiceidæ.* By EDWARD T. BROWNE, University College, London.

THIS is an old family-name to which I have given a new definition. Although the character selected is a conspicuous one, it has not hitherto taken an important position in classification, but has been chiefly used as a character for distinguishing certain genera. This character, now selected for the family, is the presence of cordyli, commonly called sensory clubs, on the margin of the umbrella.

Some of the genera which possess cordyli were placed by Hæckel amongst the Thaumantidæ, of which the Laodiceidæ formed a subfamily, and was distinguished from the other subfamilies not by the presence of cordyli, but by the number of radial canals. The other genera, on account of their having branched radial canals, were placed in the Cannotidæ, a family which Maas (1904) has recently revised.

In the family Laodiceidæ I have placed the following genera:—*Laodice*, *Staurophora*, *Ptychogena*, *Staurodiscus*, *Toxorchis*, and *Melicertissa*. The characters of these genera have been revised, but the revision has not led to a transference of species. The species of all the genera have been subjected to an impartial examination, which has resulted in a reduction of their number. For the purpose of making

this revision as complete as possible I have briefly given the characters of new species of *Staurophora* and *Ptychogena*.

A cordylus is an organ of a well-marked character, and when once recognized it is not likely to be mistaken for anything else on the margin of the umbrella. It is quite distinct from marginal bulbs and tubercles or sprouting tentacles and cirri. Its shape varies slightly in different genera, but it always has a clear translucent appearance, without any coloration, and is free from nematocysts. It is also without otoliths and such concretions as are generally found in sense-organs. Its function, however, has not yet been definitely found out, but it is generally regarded as a sensory organ. The first adequate description of a cordylus was given by Brooks (1895), to whom the sensory theory is due.

Hartlaub's positive statement (1897) that the cordyli of *Staurophora* develop into tentacles led me to carefully examine early and intermediate stages of *Laodice*. If cordyli are the forerunners of tentacles one would naturally expect to see them in the earliest stage or in the very early stages; but they do not make their appearance until the Medusa has at least trebled the original number of its tentacles.

After searching the margins of the umbrella of several dozen young *Laodice*, I did find two specimens which showed cordyli being converted into tentacles. They showed, however, an exception to the normal course of development of a tentacle which needs an explanation.

When there is ample room between two tentacles one finds a cordylus, a cirrus, and a tentacular bud in a single row and isolated from one another. The tentacular bud increases in size until it becomes a bulb, from which sprouts out the tentacle. Under this condition there is not the slightest indication of a cordylus becoming converted into a tentacle. The stalk of the cordylus arises direct from the margin of the umbrella and does not touch the tentacular bulb.

In most young specimens the interval between two tentacles has frequently the appearance of being overcrowded, owing to the marginal appendages developing faster than the margin of the umbrella. The tentacular buds arise alongside of, or even underneath, the stalk of a cordylus, so that a cordylus is often seen on the side, or on the top, of a tentacular bulb. One specimen was seen with a number of buds and bulbs with tentacles developing; each bulb had a cirrus on its outer side and a cordylus on its inner side. It was evident that the tentacular bud had forced its way up between the cirrus and

the cordylus. On the development of the bud into a bulb the cirrus and cordylus were carried up on to the side of the bulb. It is rare to find a cirrus and cordylus on the side of a basal bulb of a large tentacle, so that these organs either change their position or disappear. They cannot develop into a tentacle, because the tentacle is already formed.

In the two specimens showing the cordyli being converted into tentacles it was fairly evident that the tentacular bud made its appearance right underneath the already fully developed cordylus. There were a sufficient number of bulbs with cordyli to trace out the various stages of growth. One bulb showed very distinctly the conical apex of the sprouting tentacle beneath the translucent stalk of a cordylus, and later stages showed the translucent cells of the cordyli becoming opaque as the tentacles advanced in size. The cordylus in the process of conversion becomes very large, and finally loses its characteristic shape. It seems to me that the cells of the cordylus are converted into tentacular cells, and as soon as that process is completed the rounded end of the cordylus becomes pointed and indistinguishable from an ordinary half-grown tentacle.

As the conversion of cordyli into tentacles was only seen in two young stages, it is probably due to the cordyli being in the way of rapidly growing tentacles, and consequently they were absorbed.

A time comes when tentacular growth stops and the bulbs remain in an arrested state of development. This, I think, accounts for some adult specimens having their cordyli upon small bulbs and also upon bulbs with ocelli.

Family Laodiceidæ, L. Agassiz, 1862.

Character of the Family.—Leptomedusæ with cordyli, commonly called sensory clubs, on the margin of the umbrella.

Genus LAODICE, Lesson, 1843.

Generic character.—Laodiceidæ with four radial canals; with a central stomach and mouth; with ocelli on the basal bulbs of the tentacles.

This is the best-known genus of the family. Although I have excluded several species which were formerly placed in the genus and reduced others to synonyms, still I am not quite satisfied with the result, owing to the difficulty of

finding suitable characters for the determination of the species. As the means of distinguishing the species the following characters are used :—

- a. The presence or absence of cirri.
- b. The presence or absence of a spur at the base of the tentacles.
- c. The number of cordyli between the tentacles.
- d. The shape of the gonads.

Laodice undulata (Forbes & Goodsir), 1851.

- Thaumantias undulata*, Forbes & Goodsir, 1851, p. 313, pl. x. fig. 7.
Thaumantias confluens, Forbes & Goodsir, 1851, p. 314, pl. x. fig. 8.
Thaumantias mediterranea, Gegenbaur, 1856, p. 237, Taf. viii. figs. 1-3.
Cosmetira punctata, Hæckel, 1864, p. 334.
Laodice calcarata, Browne, 1898, p. 823, pl. xlix. fig. 4.
Laodice cruciata, Maas, 1904, p. 18.

Laodice calcarata, A. Agassiz, 1862.

- Laodicea calcarata*, A. Agassiz, 1862, p. 350.
Lafoea calcarata, A. Agassiz, 1865, p. 122, figs. 184-194.
Laodice calcarata, Hæckel, 1879, p. 134.
Laodice calcarata, Brooks, 1895, p. 287, pl. xvii.

Laodice ulothrix (Hæckel), 1877.

- Cosmetira ulothrix*, Hæckel, 1877.
Laodice ulothrix, Hæckel, 1879, p. 133, Taf. viii. figs. 5-7.
Laodice ulothrix, Mayer, 1900, p. 49; Mayer, 1904, p. 14, pl. iv. fig. 30.

In 1851 Forbes and Goodsir described as new species *Thaumantias undulata* and *Thaumantias confluens*, which they found on the west coast of Scotland. I consider *T. confluens* to be an earlier stage of *T. undulata*. It is quite evident from the description and figure that *T. undulata* belongs to the genus *Laodice*. The specimens were seen alive, and in their description the authors state that each tentacle "springs from a bulbous base, bearing a small but distinct black ocellus. Between each pair of tentacula is a minute, transparent, mobile, pedunculated tubercle. [The figure shows these tubercles, which have the appearance of roughly drawn cordyli.] Down the four gastrovascular canals, very nearly from their divergence to the margin of the umbrella, run the four linear genital glands, tinged with rose-colour. They are very peculiarly formed, each hanging from the surface of the subumbrella in the shape of a pair of undulated membranous curtains, strikingly reminding us of the appearance presented by *Staurophora*, but differing in their nature; for, in the animal we are describing, they are

assuredly distinct from the stomach-lobes. The stomach is rather large and quadrangularly campanulate, rose-coloured, and slightly fimbriated at the margins." The umbrella is hemispherical, about $1\frac{1}{2}$ inches (38 mm.) in diameter. The tentacles are about 160 in number. The authors do not mention or figure cirri, which should have been present in the specimens.

The *Laodice* which I have found on the British coasts I called *Laodice calcarata*, and used the name before I had seen the paper by Forbes and Goodsir. Otherwise I should have no doubt called the British form *Laodice undulata*. The fact that Forbes and Goodsir mention the presence of one "pedunculated tubercle" between every two tentacles, by which they evidently mean a cordylus, shows, I think, clearly that they had found a *Laodice*, and, so far as I know, there is only one species of *Laodice* on the British coasts.

Forbes and Goodsir say nothing whatever about cirri, which they would have seen if the living specimens had been carefully examined. In preserved specimens cirri are sometimes scarce and also the cordyli, as these organs are rather fragile. In the second species, *Thaumantias confluentis*, the figure of the margin of the umbrella does show two or three projections between the tentacles. They may possibly represent the bases of broken off cirri and a cordylus. The authors state that this species has also pedunculated tubercles.

To Gegenbaur the credit must be given for the first adequate description with good figures of a *Laodice* when he described *Thaumantias mediterranea*, 1856.

It is futile to consider *Medusa cruciata* of Forskål, 1775, as a *Laodice*, because the essential character of the family is not mentioned or figured. Hæckel, moreover, has caused utter confusion by placing several species clearly belonging to other genera as synonyms of *Laodice cruciata*. The law of priority is carried too far when it is extended to species which have never been either described or figured, so as to indicate the character of the family or genus.

In the above list of references there are six distinct specific names; three of them may be safely regarded as synonyms. I have made several endeavours to find a single character or combinations of characters whereby the remaining three species—*L. undulata*, *L. calcarata*, and *L. ulothricæ*—could be distinguished from each other and readily recognized. When the descriptions and figures of these species have been analyzed one finds that new figures, with more detailed descriptions based upon more specimens, are needed. It is

solely for that reason that I have refrained from joining all the above-mentioned species under one name.

The normal number of cordyli between every two tentacles in the British form is one, and one is also found in the Mediterranean form. *Laodice ulothrix*, according to Hæckel's figure, has two cordyli, but Mayer has described specimens with one cordylus between every two tentacles. *Laodice calcarata*, according to Agassiz, has one or two cordyli between the tentacles, but Brooks mentions specimens with only one. It is evident that there is one cordylus between every two tentacles and that some specimens may have one or two; but there is no evidence that any of the North-Atlantic species have always two cordyli between every two tentacles. The same is the case with the cirri, either one or two between every two tentacles. Allowances must be made for development and also for breakage in preserved specimens. Brooks records a variety of *Laodice* without cirri from the Bahamas, but Mayer records specimens with cirri from the same region.

The ocelli are certainly very variable in number. In some specimens every tentacle is provided with an ocellus, whereas in others comparatively only a few tentacles have ocelli. Gegenbaur figures an ocellus at the base of the cordylus in *L. mediterranea*, and Brooks also mentions a variety with ocelli in the same position from the Bahamas. The ocellus belongs really to a tentacular bulb in an arrested state of development, upon which the cordylus is situated. I have found that the British form of *Laodice* has a very variable number of irregularly distributed ocelli, so that they are of little use for a specific character.

The length of the gonads along the radial canals is useless for a specific character, as the length depends upon growth.

There is certainly a difference in colour, but colour unfortunately usually disappears after preservation, and, moreover, the descriptions do not always state whether the colour described is that of the living medusa or of a specimen in alcohol or some other fluid. I have seen large living specimens of the British form which were quite colourless, and other specimens from the same locality with pink gonads. There is, however, a tendency for the European forms to have pinkish gonads and the American forms to have dark yellowish to brown gonads. Mayer describes *L. ulothrix* from the Bahamas as being dull pink, brownish, or greenish white, so that it appears to me that colour is of little use as a specific character.

On bringing together the characters of the three species

found in the North Atlantic and Mediterranean, one finds that between every two tentacles there are always one cordylus (rarely two) and either one or two cirri. The ocelli are variable in number and not quite constant in position, and their colour is variable—dark brown, dark violet, or black. The colour of gonads and other organs is also variable—dark yellow, brown, pink, or pale violet. The tentacles are numerous and have, when fully developed, an endodermal basal spur, which is variable in length and shape. The gonads, when mature, form undulating bands upon the radial canals.

Distribution. North Atlantic; Europe, British coasts (*L. undulata*, Forbes and Goodsir; *L. calcarata*, Browne).

Mediterranean (*L. mediterranea*, Gegenbaur; *L. cruciata*, Maas).

Canary Is. (*L. ulothrix*, Hæckel).

Bahamas (*L. ulothrix*, Mayer).

North Atlantic; American coast (*L. calcarata*, Agassiz, Brooks, Hargitt).

Tortugas, off Florida (*L. ulothrix*, Mayer).

*The Hydroids belonging to Laodice calcarata and
Laodice undulata.*

A. Agassiz (1865, p. 124) gives a brief description with a figure of the hydroid which he believed to belong to *Laodice calcarata*. It is necessary, however, to criticize this connexion of the hydroid with the medusa, as it is a matter of some importance.

Agassiz discovered a small hydroid which he considered to belong to the genus *Lafoea*, hence the name *Lafoea calcarata*. The hydroid is a small creeping form and was found just below low-tide mark in Buzzard's Bay, Naushon. The hydranths are arranged "in a quincunx manner on both sides of a long slender creeping stolon, which does not branch." The figure shows that the perisarc is tube-like, and there is no evidence of an operculum. The hydroid has a few very large gonothecæ, inside of which develop medusæ. The medusa on liberation has "two long tentacles, two slightly developed ones, and four more hardly perceptible in the middle of the space between the chymiferous tubes (radial canals)." The basal bulbs of the two tentacles and the other six tentacular buds each have one dark pigment-spot. This medusa on liberation from its hydroid has only two long tentacles, no cirri, and no cordyli.

The next stage mentioned is much older than the earliest

stage. As there is no evidence to show that Agassiz reared the medusæ in an aquarium, I presume that this later stage was taken out of the sea. It has sixteen tentacles and a cirrus between every two tentacles. The basal bulbs of all the tentacles are provided with ocelli; but there are no cordyli. It seems to me that the similarity between the above two stages is the presence of ocelli, and it is well to remember that there are other genera besides *Laodice* with dark ocelli on the basal bulbs.

Metschnikoff (1886, p. 83, Taf. iv. figs. 17-31, Taf. v. fig. 1) has given an excellent description of the development of the ova of *Laodice cruciata* and splendid figures of the hydroids which he reared from the ova. His work is entirely embryological, and no description of the medusa is given. I presume he means *Laodice cruciata* according to Hæckel, and that his species was really *Laodice mediterranea* of Gegenbaur; for this is the only species of *Laodice* among Hæckel's many synonyms. The hydroid which Metschnikoff reared is similar to *Cuspidella humilis*, Hincks.

Hincks (1868) described three species of *Cuspidella*—*C. humilis*, *C. costata*, and *C. grandis*. The descriptions are based upon the shape of the hydrothecæ. It is evident to me that the shape of the hydrotheca of *Cuspidella* and its allies is not sufficient to base specific characters upon, and that the structure of the hydranth must be taken into consideration, and also the gonosome. It is quite likely that *Cuspidella costata* is only another form of *C. humilis*. For the purpose in view it is sufficient to know that Metschnikoff reared from the ovum of *Laodice* a hydroid belonging to the genus *Cuspidella*, which is distinguished generically from Agassiz's *Lafœa* by the presence of an operculum on the top of the hydrotheca.

During June 1906 I received a letter from Miss M. Delap, of Valencia Island, stating that she had kept a colony of *Cuspidella costata* under observation and had seen the colony liberate medusæ. Later on I received drawings of the hydroid and its medusa and also specimens. The hydrotheca is like Hincks's figure and has a few transverse rings and an operculum. The gonotheca is somewhat similar to the hydrotheca, but is about twice the length and is without transverse rings. The figure drawn by Miss Delap shows two medusa-buds inside the gonotheca and a medusa just escaping through the operculum. The medusa on liberation has two opposite perradial tentacles and two opposite perradial tentacular bulbs. On each side of the two tentacles there is a cirrus, adradial in position, and cirrus-buds occupy

the other four adradial positions. The umbrella is nearly as broad as high, about 1 mm., and has a few nematocysts scattered over the exumbrella. The four perradial tentacular bulbs have black ocelli on their inner side. The medusa on liberation is without cordyli.

Metschnikoff figures two specimens of the young hydroid, one with a short hydrotheca and the other with a long hydrotheca; both are without transverse rings, which are generally considered to be lines of growth. Miss Delap's figure is similar to Metschnikoff's hydroid with a short hydrotheca, but shows the transverse rings.

The comparison of *Cuspidella costata* with *Lafoea calcarata* of Agassiz shows that the two hydroids are not of the same genus. The hydrotheca of *Lafoea calcarata* is without an operculum, and its gonotheca is also without an operculum and is quite different in shape. Agassiz's hydroid is not a *Cuspidella*, and it is not a true *Lafoea*, because it liberates medusæ. *Lafoea* has a peculiar gonosome, which until recently was regarded as a distinct hydroid, generically known as *Coppinia*. Moreover, the medusæ liberated from these two hydroids are not similar. Agassiz's medusa has two tentacles and six tentacular buds, all with ocelli, and no cirri. Miss Delap's medusa has two tentacles and two tentacular buds, all with ocelli, and four cirri. Either Agassiz's hydroid does not belong to *Laodice calcarata*, or if it does, then the adult medusæ found on the American coast and on the British coast should show specific differences, sufficiently conspicuous to distinguish one from the other.

I have in my collection of British medusæ some young stages of *Laodice* taken in tow-nets at Valencia in 1897 and at the Scilly Isles in 1899 and 1903. The earliest stage, about 1.25 mm. in diameter, has four perradial tentacles, each with a black ocellus on the basal bulb, four interradial, eight adradial, and a few scattered buds or bulbs, all without ocelli. Between every two bulbs there is generally a cirrus; but there is not the slightest trace of a cordylus. As development proceeds tentacles sprout out from the bulbs, more buds or bulbs appear, and more cirri come into existence. It is not until the umbrella is 3-4 mm. in diameter that cordyli are clearly recognizable. (Many of the early stages were examined alive.)

Laodice is the only medusa on the British coasts with black ocelli on the inner side of the basal bulbs and with cirri, so that these early stages, without cordyli, are not likely to belong to another genus. The presence of black ocelli and cirri in the medusa liberated from *Cuspidella costata* indicates

a *Laodice*, and there is no reason for supposing that after a little further development it would not become similar to the earliest stage in my series of young *Laodice*.

The absence of cirri in the medusa liberated from *Lafoea calcarata* seems to indicate that it is not a *Laodice*. The later stage, with cirri, described by Agassiz, has the characters of a *Laodice*, and agrees with one of my early stages before the cordyli begin to develop; but, as I have already pointed out, there is no evidence that this particular specimen was reared from the hydroid.

Laodice indica, Browne, 1905, p. 136, pl. i. fig. 5, pl. iv. figs. 7-11.

This species is very much like *Laodice undulata*, but the tentacles are without a basal spur. Cirri present. One cordylus between every two tentacles.

Distribution. Indian Ocean, Ceylon.

Laodice marama, Agassiz and Mayer, 1899, p. 162, pl. iii. figs. 7-8.

This species closely resembles *Laodice indica*, but can be distinguished from it by the presence of usually two or three cordyli between every two tentacles. Cirri present. The tentacles have long tapering basal bulbs and are without a spur. The size of the umbrella and the general appearance of the gonads suggests the description having been based upon a young immature stage.

The presence of cirri distinguishes this species from *L. pulchra*.

Distribution. Pacific Ocean, Fiji.

Laodice pulchra, Browne, 1902, p. 280.

In this species there are generally three to four cordyli between every two tentacles, and they are situated upon small bulbs. Cirri absent. The tentacles are without a basal spur. Gonads arranged in a series of short folds along both sides of very large radial canals.

Distribution. South Atlantic, Falkland Islands.

Laodice Maasii, nov. nom.

Laodice fijiana, var. *indica*, Maas, 1905, p. 25, Taf. ii. figs. 14-15, Taf. v. figs. 32-35.

It was not without some hesitation that I decided upon giving a new name to the *Laodice* described by Maas in the

report on the 'Siboga' medusæ. Maas believes his specimens to be either identical with, or closely related to, *Laodice fijiana* of Agassiz and Mayer. If not identical, he suggests that they should be regarded as a variety under the name of *indica*. In describing the specimens Maas took the opportunity to criticize the genus *Laodice* and its allies. His is an excellent criticism, and after I had independently investigated the literature on the species I was pleased to find myself in agreement with him.

Laodice Maasii is twice to three times the size of *L. fijiana*, with more than twice the number of tentacles, and with many more cordyli. The gonads extend much further along the radial canals. Both species are provided with ocelli on about two thirds of the basal bulbs of the tentacles. Taking the above characters alone there is no reason for not imagining the smaller *L. fijiana* growing to a larger size and possessing more tentacles, more cordyli, and longer gonads. Then it would resemble *L. Maasii*. The medusa figured by Agassiz and Mayer does not look at all like Maas's medusa. The gonads of *L. fijiana* are adjacent to the stomach and on conspicuous diverticula of the radial canals, whereas in Maas's medusa the diverticula are not visible in the figures, though the author states that there are outgrowths along the radial canals. It is a question of degree between a slight outgrowth and a conspicuous one. There is, however, one character by which the two species can be distinguished. Maas figures and describes the tentacles with basal spurs, which are not present in *L. fijiana*.

Distribution. East Indian Archipelago.

Laodice fijiana, Agassiz and Mayer, 1899, p. 163, pl. iii. figs. 9-10.

This species has a very few cordyli; only about eight are present, though the tentacles number about seventy. Cirri absent. Tentacles without a basal spur. The gonads are upon short lateral diverticula of the radial canals. The scarcity of cordyli and the presence of conspicuous diverticula on the radial canals carrying the gonads appear to be the principal characters of this species.

Distribution. Pacific Ocean, Fiji.

The following species are excluded from the genus *Laodice*:—

Laodice cruciata, Hæckel, 1879.

I think it would be a distinct advantage if this specific

name were regarded as obsolete. In the first place, it is impossible to identify the original *Medusa cruciata* of Forskål, as its description and figures are too indefinite. In the second place, Hæckel has produced great confusion by putting under the name of *Laodice cruciata* several species which clearly belong to other genera. I have criticized in detail Hæckel's synonyms in the Proc. Zool. Soc. (1896, p. 482), and it is not necessary to do so again. There is only one genuine *Laodice* amongst the lot, namely *Thaumantias mediterranea*, Gegenbaur.

Cosmetira salinarum, du Plessis, 1879, p. 39, pl. xii.

Laodice salinarum, Hæckel, 1880, p. 636.

This species was found by du Plessis in brackish-water ditches in a salt-marsh near Cette. Du Plessis says that "it is curious that it is a miniature copy of a much larger species, *Cosmetira punctata*, which occurs in the sea near Cette." *Cosmetira punctata* is a synonym of *Laodice mediterranea*. The description given by du Plessis is rather vague, and the photograph, which is the only figure, is too fuzzy to show any details. From the description I rather think that the medusa is more likely to be an *Olindias* or one of the *Olindiadæ*. It was found suspended by the long tentacles from the lower surfaces of masses of algæ. This points to the tentacles having adhesive disks. The tentacles are provided with rings of nematocysts, and between the tentacles at regular intervals are some little reddish sacs, which have a pigment-spot and some crystalline concretions. The sensory clubs of the *Laodiceidæ* are without otoliths or crystalline concretions. There is no clear evidence that this medusa belongs to the *Laodiceidæ*, and it should be searched for again and properly described. Maas (1905) has also expressed an opinion to the same effect.

Laodice cellularia, A. Agassiz, 1862, p. 350; id. 1865, p. 127, figs. 195-196.

Thaumantias cellularia, Hæckel, 1879, p. 129; Murbach and Shearer, 1803, p. 172, pl. xvii. fig. 2.

Agassiz, in his original description of this species, was doubtful whether it belonged to the genus *Laodice*, for the examination of the tentacles could not be made sufficiently accurate to determine this point. Murbach and Shearer have again found this medusa. They definitely state that specimens preserved in formalin do not show ocelli or cirri. As nothing

is said about sensory clubs, it may be presumed that these organs are also absent, and therefore the medusa is not a *Laodice*. Whether it is a *Thaumantias* or not depends upon the result of a revision of the Thaumantidæ and Eucopidæ. *Thaumantias cellularia* inhabits Puget Sound and the straits between Vancouver Island and British Columbia.

Laodice Chapmani, Günther, 1903, p. 425, pl. ix. figs. 1-3.

Maas has already expressed an opinion that this species is not a *Laodice*. It certainly does not look like one, and the absence of cordyli excludes it from the Laodiceidæ. The description is based upon a single specimen found in the North Atlantic.

Laodice neptuna, Mayer, 1900, p. 48, pl. xx. figs. 50-52.

This medusa was found at the Tortugas, off the coast of Florida. It has been well described and figured by Mayer, who does not mention the existence of cordyli; consequently I exclude it from the Laodiceidæ. In general appearance this medusa does not look like a *Laodice*, but more like a medusa belonging to another family at an intermediate stage in development.

Genus STAUROPHORA, Brandt, 1835.

Staurophora, Hæckel, 1879.

Staurostoma, Hæckel, 1879.

Generic character.—Laodiceidæ with four radial canals; with a narrow cross-shaped stomach and mouth extending across the subumbrella; with ocelli on the basal bulbs of the tentacles.

Although Brandt established the genus *Staurophora*, it was Louis Agassiz who, in his description of *Staurophora luciniata*, first gave an accurate account of a *Staurophora*, and clearly demonstrated the existence of a mouth and stomach. One of his figures shows distinctly a cordylus, though no mention is made of this organ in the description. Agassiz was perfectly right in associating his species with Brandt's genus *Staurophora*.

Hæckel has certainly misinterpreted Brandt's figures of *Staurophora* in considering the lobes of the stomach to be blind lateral branches of the radial canals; hence his placing *Staurophora* in the family Cannotidæ. This error led to his introducing a new genus, *Staurostoma*, for Agassiz's species, which was placed amongst the Thaumantidæ. Hartlaub and

Maas have also expressed their disapproval of Hæckel's *Staurostoma*.

The most interesting character of *Staurophora* is the position of the stomach, mouth, and the gonads. How they obtained their present position will be more readily understood after considering the position of these organs in *Laodice*. It appears to me that *Staurophora* is descended from a *Laodice*-like medusa.

In *Laodice pulchra* the radial canals are extremely large and the gonads are situated upon them. The gonads are arranged in a series of short folds forming a row on each side of the canals, close to the subumbrella. They extend along the whole length of the enlarged canals right up to the central stomach, where they very nearly meet the gonads belonging to the adjacent canals. In my original description of *Laodice pulchra* the enlarged portions of the radial canals were regarded as lobes of the stomach, and not as radial canals. I considered the very short canals between the lobes and the circular canal to be the true radial canals. This species certainly has the appearance of possessing a very large four-rayed stomach with gonads extending along the lobes and a large central mouth with the margin in folds.

If one were to slit open along the middle the enlarged portions of each radial canal of *Laodice pulchra*, and imagine the cut margins to be the margins of a mouth, then the position of the mouth, stomach, and gonads would be similar to those of *Staurophora*.

I think the mouth of *Staurophora* has arisen by the outgrowth of a central mouth along the enlarged portions of the radial canals of a *Laodice*-like medusa, and consequently those portions of the radial canals have been converted into a four-rayed stomach. The gonads have not changed their position, but in *Staurophora* they have lengthened slightly and meet in the centre of the cross.

The earliest stages of *Staurophora laciniata* are very similar to those of a young *Laodice*. They have a small central stomach and mouth and four radial canals. A. Agassiz has traced the development of the mouth of *S. laciniata*, and his figures clearly show how the mouth grows out to form a perradial cross.

There is no disputing the fact that in *Staurophora* the gonads are upon the walls of the stomach and occupy the position of the gonads of an Anthomedusa. There is, however, very good evidence that *Laodice undulata* comes from a calyptoblastic hydroid belonging to the genus *Cuspidella*, and there are also *Laodiceidæ* with gonads on the radial

canals far away from the stomach; so that the position of the gonads of *Staurophora* does not justify its removal to the Anthomedusæ nor allow one to look upon the enlarged radial canals of *Laodice* as lobes of the stomach. Hartlaub (1897) has suggested that *Staurophora* is related to the Tiaridæ, because the early stages bear a resemblance to *Tiara*.

Staurophora Mertensii, Brandt, 1835; id. 1838, p. 400, Taf. xxiv.-xxv.; Hæckel, 1879, p. 149.

This is the type species of the genus, and as it has not been taken since the days of Brandt, a fresh description to meet modern requirements and detailed drawings are much needed.

Brandt's figures show that the cross-shaped stomach and mouth, which extend right across the subumbrella, have a large number of short lateral lobes. These lobes form the characteristic feature of the species, as they are arranged in a definite manner, either alternating or in pairs, and have a definite shape.

Distribution. North Pacific; Norfolk Sound and off the Aleutian Islands.

Staurophora arctica (Hæckel), 1879.

Staurostoma arctica, Hæckel, 1879, p. 131; Levinsen, 1892, p. 145; Aurivillius, 1896, p. 194; Linko, 1900, p. 4, Taf. ii. figs. 22-25; 1904, p. 218; 1907, p. 151.

This species, according to Hæckel, has the gastro-genital cross extending completely across the subumbrella, but the mouth extends for only half that distance, so that the distal half of each ray is a closed tube.

Linko (1900) states that all the tentacles (over 400 in number) are equal in size and similar, and that on their inner side, close to the velum, there is blackish ocellus. He figures a long cordylus between every two tentacles and also a sensory vesicle above the velum, one opposite every tentacle. So far as I know, a sensory vesicle has not been yet found in any other species of the Laodiceidæ. It is a small vesicle, with a single otolith, embedded in the ectoderm, and situated just at the juncture of the velum with the subumbrella.

Distribution. Arctic Ocean; Spitzbergen (Hæckel). Barents Sea, Kolafjord and Ekaterinen Haven in Lapland (Linko). West coast of Greenland (Levinson).

Staurophora laciniata, L. Agassiz, 1849.

Staurophora laciniata, L. Agassiz, 1849, p. 300, pl. vii.; A. Agassiz, 1865, p. 136, figs. 215-219; Wagner, 1885, p. 80, Taf. iv.; Fewkes, 1886, p. 958; Fewkes, 1888, p. 233; Hartlaub, 1897, p. 484, Taf. xvi. c, Taf. xxii.; Broch, 1905, p. 7.

Staurostoma laciniata, Hæckel, 1879, p. 130; Hargitt, 1905, p. 43.

Staurophora Keithii, Peach, 1867, p. 358, pl. ii.

Thaumantias melanops, M'Intosh, 1890, p. 40, pl. viii.; Hartlaub, 1904, p. 103.

This species has the mouth extending along the whole length of the stomach, and the tentacles form alternating series of large and small ones, but the difference in size is very slight. Both this species and *S. arctica* require further examination, and careful drawings should be made of the organs on the margin of the umbrella, especially of the tentacles. It is not yet definitely proved that the latter is a distinct species.

Peach states that his specimens agreed in every detail with L. Agassiz's description of *S. laciniata*, except that the four rays of the stomach meet to form a perfect cross, whereas Agassiz figures an imperfect cross. This slight difference is not a specific character, though Peach attached great importance to it.

M'Intosh described under the name of *Thaumantias melanops* an abnormal Hydromedusa without stomach or mouth. Hartlaub (1904) has examined M'Intosh's specimen, and states that it is a typical *S. laciniata*.

Hartlaub (1897) records the capture of a large specimen at Heligoland, but he is a little uncertain whether it belongs to *S. arctica* or *S. laciniata*. He also obtained some very early stages, about 2 mm. in diameter, and kept them alive for several weeks in an aquarium. They fed on copepods and grew at a great rate. It was whilst watching the development of these young stages that Hartlaub saw cordyli develop direct into tentacles. The figures of these young stages do not show cordyli, but only tentacular buds.

Distribution. Arctic Ocean; White Sea (*Wagner*). North Atlantic; America, Boston Harbour (*L. Agassiz*); Nahant (*A. Agassiz*); Woods Holl (*Hargitt*). Lat. 38° N., long. 68° W. (*Fewkes*). Bay of Fundy; Grand Manan Is. and Frye's Is. (*Fewkes*, 1888). Europe; Norway (*Broch*). Scotland, east coast (*Peach*, *M'Intosh*). Heligoland (*Hartlaub*).

Staurophora falklandica, sp. n.

This new species was taken by the Scottish Antarctic

Expedition (S.S. 'Scotia') in Stanley Harbour, Falkland Islands. A description of it, with figures, will be given in the Report on the Medusæ collected by the expedition, to be published in the 'Transactions of the Royal Society of Edinburgh.'

It is very much like *S. laciniata*, but has a series of long tentacles and a series of very short rudimentary tentacles.

Genus PTYCHOGENA, A. Agassiz, 1865.

Generic character.—Laodiceidæ with four radial canals; with a central stomach and mouth; with the basal bulbs of the tentacles without ocelli.

Ptychogena lactea, A. Agassiz, 1865.

Ptychogena lactea, A. Agassiz, 1865, p. 137, figs. 220-224; Hæckel, 1879, p. 147; Hargitt, 1905, p. 45.

Ptychogena pinnulata, Hæckel, 1879, p. 148; Hæckel, 1882, p. 7, pl. ii.; Grönberg, 1898, p. 465; Levinsen, 1892, p. 145.

Ptychogena pinnulata, var. *intermedia*, Linko, 1904, p. 217.

This species was first discovered by A. Agassiz, who found it abundant for a few days in Massachusetts Bay, about 1864, and it has not again been recorded for the North-American coast. This single record rather indicates that this medusa is not a native of that region, but has probably drifted down south from the Arctic regions.

According to Hæckel *P. pinnulata* differs from *P. lactea* in the shape of the gonads. Those of the latter have fewer lateral diverticula, but some of the longer ones are slightly branched.

Linko has found in Barents Sea a form which he considers to be a variety intermediate between *P. lactea* and *P. pinnulata*. This variety has gonads shaped like *P. lactea*, but with about as many diverticula as *P. pinnulata*. It agrees in colour with *P. lactea*. I do not think that the differences in the shape and size of the gonads are, taken by themselves, sufficient for a specific character, and Linko's variety shows a connexion between the two species. The differences in shape and size are more likely due to the development of the gonads.

This species is probably a scarce Arctic medusa which drifts south into the North Atlantic. There is no trustworthy evidence that it is a deep-sea form.

Distribution. Arctic Ocean: Greenland (*Grönberg*). Barents Sea (*Linko*). North Atlantic: America, Massachusetts Bay and Nahant (*A. Agassiz*). Iceland (*Levinson*). Between

Ireland and Iceland, lat. $59^{\circ} 7' N.$, long. $13^{\circ} 32' W.$, lat. $42^{\circ} 8' N.$, long. $63^{\circ} 39' W.$ (*Hæckel*).

Ptychogena antarctica, sp. n.

This new species was taken off Cape Adare, Victoria Land, by the 'Southern Cross' Expedition. There is only one specimen, which unfortunately has a large hole through the top of the umbrella. The stomach and mouth are completely gone and only the distal halves of the four gonads remain. The margin of the umbrella is in perfect condition. The basal bulbs of the tentacles are laterally compressed, and there are no ocelli. They belong to the same type of bulb as that figured by Agassiz and Hæckel for *P. lactea*, and are not like the basal bulbs of *Staurophora* or *Laodice*.

The gonads are large, with broad lateral folds. In the region of the gonads the radial canals show a wavy margin corresponding to the principal folds of the gonads, but the canals have no lateral diverticula like *P. lactea*. The shape of the gonads is intermediate between *P. lactea* and *P. longigona*.

The new species can easily be distinguished from *P. lactea* by the absence of diverticula on the radial canals and by the colour of the tentacles, which are red. It is not so easy to distinguish it from *P. longigona*, because the organs on the margin of the umbrella of *P. longigona* have not been described in detail or figured. The gonads of the *P. antarctica* have much broader lateral folds and do not extend so far along the radial canals.

A description with figures of *P. antarctica* will appear in the Report on the *Medusæ* collected by the 'Discovery' and 'Southern Cross' Expeditions.

Ptychogena longigona, Maas, 1893, p. 64, Taf. vi. figs. 7-9.

Maas, in the description of this species, states that it has "Randkolben," by which I presume he means cordyli. As he has omitted to figure the margin of the umbrella, it is necessary to rely upon the brief description. The gonads are very long, extending the whole length of the radial canals, and are arranged in a series of lateral folds or lobes, but the radial canals have no lateral diverticula as in *P. lactea*.

Distribution. North Atlantic, off the north-west coast of Scotland.

Genus *STAURODISCUS*, Hæckel, 1879.

Generic character.—Laodiceidæ with four main radial canals, each with lateral branches.

The two genera *Staurodiscus* and *Toxorchis* are distinguished from the other genera of the Laodiceidæ by the presence of branched radial canals. It was on account of the branching of the canals that Hæckel placed these genera in the Cannotidæ. The Cannotidæ, as a distinct family, has now ceased to exist; its destruction was due to a revision of its genera by Maas (1904). *Staurodiscus* and *Toxorchis* were transferred by Maas to the Berenicidæ, to which he gave an emended definition.

Berenice is the type genus of the Berenicidæ. One species (*B. rosea*) is without marginal bulbs, but the other (*B. Huxleyi*) has bulbs. I am uncertain whether these bulbs are cordyli or only tentacular bulbs; if they should turn out to be cordyli, then the species should be transferred to the genus *Staurodiscus*.

Staurodiscus tetrastaurus, Hæckel, 1879.

Staurodiscus tetrastaurus, Hæckel, 1878, p. 145, Taf. ix. figs. 1-3;

Mayer, 1900, p. 46, pls. xviii.-xix. figs. 47-49; Maas, 1904, p. 440.

Staurodiscus heterosceles, Hæckel, 1879, p. 146.

In this species each of the radial canals has a pair of lateral branches which do not join the circular canal. The gonads develop upon the blind branches and also upon the portion of the main canal between the branches and the circular canal. There are eight to sixteen tentacles and two or three cordyli between every two tentacles. Cirri absent. A black ocellus at the base of all the tentacles and cordyli. Mayer describes young stages as well as adult, and states that the ocelli are endodermal.

Distribution. North Atlantic: Canary Is. (Hæckel). Tortugas (Mayer).

Staurodiscus nigricans, Agassiz and Mayer, 1899, p. 164, pl. iv. figs. 11-12.

This species has radial canals with a pair of lateral branches, which do join the circular canal. The gonads are upon the branches and the portion of the main canal between the branches and the circular canal. Twelve tentacles present and six or seven cordyli between every two tentacles. Cirri and ocelli absent.

Distribution. Pacific Ocean; Fiji (Agassiz and Mayer).

Genus *TOXORCHIS*, Hæckel, 1879.

Generic character.—Laodiceidæ with six main radial canals, each one widely forked or with lateral branches.

Toxorchis arcuatus, Hæckel, 1879, p. 157, Taf. ix. figs. 6–8.

This species has only been seen by Hæckel. His figures show that each radial canal is widely forked, with gonads in the fork of the canals. The margin of the umbrella is provided with twenty-four tentacles, and between every two tentacles there are a cirrus and a cordylus. The basal bulbs of tentacles have ocelli.

Distribution. North Atlantic; Canary Is. (*Hæckel*).

It is probable that the genus *Cladocanna*, Hæckel (1879, p. 160), will ultimately become a synonym of *Toxorchis*. There are two species, *C. thalassina* (Péron, 1809), which has not been well described, and *C. polycladia*, which Hæckel has described but not figured. The latter species has six radial canals with several lateral branches, each of which is again dichotomously divided. The tentacles are very numerous and between them are cirri and marginal clubs. If the marginal clubs turn out to be cordyli, then I would suggest that the species be placed in the genus *Toxorchis*. Maas (1904) considers *C. polycladia* to be identical with *C. thalassina*, and doubtfully refers it to the genus *Toxorchis*.

Genus *MELICERTISSA*, Hæckel, 1879.

Generic character.—Laodiceidæ with eight radial canals, without lateral branches.

This genus Hæckel placed in the Thaumantidæ, in the subfamily Melicertidæ, containing genera with eight canals. This subfamily will probably disappear on the completion of the revision of the Thaumantidæ.

Melicertissa clavigera, Hæckel, 1879, p. 135, Taf. viii. figs. 8–12.

This is another species which has only been seen by Hæckel. It has only eight tentacles, and between every two tentacles there are three cordyli but no cirri. The basal bulbs of the tentacles and cordyli have ocelli.

Distribution. North Atlantic: Canary Is. (*Hæckel*).

Melicertissa malayica (Maas), 1905.

Melicertidium malayicum, Maas, 1905, p. 28, Taf. v. figs. 29-31.

This species is readily recognized by the large number of tentacles (about one hundred and fifty). There is roughly one cordylus to every two tentacles, but not between every pair of tentacles; the total number of cordyli is about half that of the tentacles. The cirri are rather scarce. About one fourth of the tentacles are provided with ocelli. The gonads are on the proximal half of the radial canals.

Distribution. East Indian Archipelago (*Maas*).

Maas placed this species in the genus *Melicertidium* as it agreed with Hæckel's definition of the genus, which happened to be an erroneous one. I have recently emended the genus *Melicertidium*. The species belonging to it have eight radial canals and numerous tentacles, but they are without cirri or marginal bulbs of any kind.

The following genera and species have for the present been excluded from the Laodiceidæ:—

Octonema eucope, Hæckel, 1879, p. 127.

The genus *Octonema* was established by Hæckel for a single species found at Honolulu, Sandwich Is. According to Hæckel's classification, the genus is distinguished from *Laodice* by the presence of only eight tentacles. The species has a large number of marginal bulbs, knobs, and cirri. Unfortunately there is no figure of this medusa, so that the exact meaning of "Randkolben" remains doubtful. Hæckel also states that a black ocellus is situated on the outer side of the basal bulb of the tentacles. The Laodiceidæ usually have the ocelli on the inner side of the basal bulbs, and there is no trustworthy evidence to show that any species of the family has ocelli on the outer side. It is quite probable that *Octonema eucope* belongs to another family.

Octonema gelatinosa, Mayer, 1900, p. 8, pl. vi. figs. 20-21.

The description of this species is based upon a single specimen taken in Charleston Harbour, U.S.A. It has the appearance of a young stage, with only four tentacles and twenty marginal bulbs. Each bulb has an ocellus, which, according to the description, is situated in the endoderm. There are eight marginal clubs, and a figure shows that their

distal end is provided with cells which look like nematocysts. Cordyli proper are without nematocysts, so that these bulbs are more likely to be tentacular bulbs.

Octorhopalon fertilis, von Lendenfeld, 1884, pp. 919, pl. xlii. figs. 14-15.

This is a little medusa, 2 mm. in diameter, having eight tentacles and eight marginal clubs, and was found by Lendenfeld at Port Jackson, Australia. The description is rather concise and the figures have been badly reproduced, so that they do not help out the short description. The author states that cirri are absent, but nothing is said about ocelli, though in the figure there are indications of an ocellus on the inner side of the basal bulbs of the tentacles.

The gonads are very large, extending along the whole length of the radial canals and also round the base of the stomach. They are folded transversely.

Before one can classify this medusa among the *Laodiceidæ* there are two points which require further elucidation. Is it a young stage with gonads just appearing or a fully grown adult? Are the clubs true cordyli? The clubs in one figure have the appearance of cordyli lying across the velum; in the second figure they project outwards and have the appearance of auditory clubs, which should contain an otocyst.

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LXV.—On new *Species of Histeridæ and Notices of others.*

By G. LEWIS, F.L.S.

THIS paper, the thirty-third of the series, is a short appendix to the last (Ann. & Mag. Nat. Hist. xx. p. 339, 1907), and furnishes at the close of the year sundry descriptions which render the preceding papers, as a whole, more complete.

List of Species.

| | |
|-----------------------------------|------------------------------------|
| <i>Teretrius placitus</i> , Horn. | Hister monitor. |
| <i>Diplogrammicus</i> , gen. nov. | <i>Carcinops lauta</i> , Zimm. |
| —— <i>intermedius</i> . | <i>Echinodes decipiens</i> , Horn. |
| <i>Zabromerphus rugicollis</i> . | <i>Saprinus ovillum</i> , Sols. |

Teretrius placitus, Horn, Tr. Amer. Ent. Soc. viii. p. 143 (1880).

"Black, shining, elytra red. Thorax nearly square, very narrowly margined, surface moderately densely and equally punctured. Elytra a little more coarsely but less densely punctured than the thorax, and without trace of striæ, colour red. Propygidium and pygidium moderately densely punctured, the latter more finely. Prosternum truncate in front.

Mesosternum with a fine entire marginal line, surface coarsely and moderately densely punctured. Legs rufous. Anterior tibiæ with four or five minute teeth, the middle with two larger teeth; posterior finely bispinose, the upper spine, which is near the middle, very small.

"L. .08 inch; 2 mm.

"A more robust species than *americanus* and less coarsely punctured, and differing especially in the dentation of the tibiæ. The colour-character is of secondary importance, and while the three specimens before me are alike, it is possible that others will occur entirely black.

"Collected by Mr. H. K. Morrison in Western Nevada."

All the specimens I have seen have red elytra.

DIPLOGRAMMICUS, gen. nov.

Body oblong, somewhat convex, punctulate above; elytra with three dorsal striæ, third sometimes broken, depressed in the sutural area; propygidium convex, not impressed nor uneven; prosternum bistriate; mesosternum marginate anteriorly. The other characters correspond with those of *Omalodes*, of which genus *omega*, Kirb., is the type.

The species to be included in *Diplogrammicus* are *ebenus* (*Omalodes*), Er., type, *Marseuli*, Sch., and *intermedius*, Lew.

Diplogrammicus intermedius, sp. n.

Oblongus, parum parallelus; fronte impressa stria retrorsum angulata; pronoto lateribus et anterioribus dense punctato; elytris striis 1-3 dorsalibus integris; propygidio pygidioque dense punctatis; prosterno in medio bistriato.

L. 9 mill.

Oblong, somewhat parallel laterally, black and shining; the head impressed longitudinally, stria complete, turning backwards in the middle, surface rather densely punctured; the thorax densely punctured laterally, less distinctly behind the head, and the points gradually lessen to the disk, scutellar region smooth, the lateral stria is not well-marked owing to the encroachment of the punctuation and it ceases at the posterior angle. The lateral striæ of *Marseuli*, Sch., is well-marked and turns inward at the base and passes the angle. The elytra are finely not closely punctulate (more distinctly so than in *Marseuli*), the striæ 1-3 are complete, but the third is somewhat irregular in its course, the others are wanting; the propygidium is coarsely punctured and somewhat gibbous along the sides; the pygidium is similarly

punctured; the prosternum is bistriate before the coxæ; the mesosternum (not quite so shortened as that of *Marseuli*) is punctulate, with marginal stria complete.

The description above is drawn from a specimen from the Chevrolat collection which Marseul named *ebeninus*, Er., but it is clearly not so. Marseul gives an excellent figure of *ebeninus* in his monograph (pl. xv. fig. 22), showing the dorsal striæ and punctuation very clearly, and the sternal stria also are separately shown. Erichson's species is a native of Argentina.

Hab. Chili (ex coll. Chevrolat).

Zabromorphus rugicollis.

Oblongo-ovalis, convexus, niger, nitidus; fronte rugoso-punctata, stria carinata, antice recta; pronoto striis 2 lateralibus integris, utrinque grosse et dense strigoso-punctato; elytris striis subhumerali 1-6 dorsalibus omnibus integris, 5^a cum suturali connexa; propygidio pygidioque dense et grosse punctatis; tibiis anticis 3-dentatis.

L. $8\frac{1}{2}$ mill.

Oblong-oval, convex, black and shining; the head coarsely and rugosely punctured, frontal stria carinate and straight anteriorly, mandibles concave, also rugose; the thorax, marginal stria fine and complete, inner and outer lateral striæ also complete, the former continuing behind the head, surface behind the middle of the neck punctured not very closely but laterally and broadly behind the angles, the surface is strongly and longitudinally strigose, the strigosities continuing but gradually narrowing to the base, behind the middle of the disk and along the base there is an irregular space almost smooth; the elytra, striæ deeply impressed, subhumeral and dorsal all complete, the fifth and sutural joining at the base; the propygidium and pygidium are densely and coarsely punctate; the prosternum, keel narrow, anterior lobe bistriate; mesosternum feebly and widely emarginate, stria complete; the anterior tibiæ are 3-dentate.

This species differs from *pachysoma*, Ancy, and *longicollis*, Mars., by the conspicuous strigose sculpture of the thorax, and from the first by having only two lateral thoracic striæ. I have seen an example of *rugicollis* in which the sutural and fifth are not joined, and I have an example of *pachysoma* in which these striæ almost join. The dorsal striæ resemble those of *apis*, Mars., a species from the Cape which I have not seen.

Hab. Benguella.

Hister monitor, sp. n.

Breviter ovalis, convexiusculus, niger, nitidus; fronte stria integra; pronoto stria interna integra, basi haud incurvata, externa ante medium abbreviata; elytris striis 1-2 integris, 3-5 obsoletis, suturali vix abbreviata; propygidio pygidioque minute punctatis, hoc anguste marginato; mesosterno stria arcuata integra; tibiis anticis 3-dentatis.

L. 8-10½ mill.

Shortly oval, rather convex, black and shining; the head flat and impunctate above, stria well-marked, complete, and nearly straight anteriorly; the thorax, inner lateral stria strong and complete, not incurved at the base, interstice rather wide, outer stria short, not passing the angle anteriorly, but extending a little behind; the elytra, striæ, inner humeral apical and just passing the middle, 1-2 dorsal complete, but the second is somewhat feeble at the base, 3-5 are traceable only in certain lights and are indicated by fine points, the sutural is fine but distinct, abbreviated anteriorly but only indistinctly shortened behind; the propygidium and the pygidium are very minutely and not closely punctured, the latter is narrowly margined on the outer edge; the mesosternum is emarginate, with a stria on both sides of the emargination, the usual marginal stria is complete and well-marked and is arched in front and does not follow the contour of the segment. *H. gorilla*, Sch., has the mesosternal stria sinuous anteriorly and no short lateral striæ. *H. adjectus*, Mars., has the lateral striæ, but they are not so conspicuous. The anterior tibiæ are strongly 3-dentate.

The dorsal striæ of this species are very peculiar, but the three species mentioned have some characters in common.

Hab. British Uganda (*Grauer*). In the Deutsches Entomologisches National Museum and my own collection. Three examples.

Also found by Messrs. Legge and Wollaston at Old Camp, E. Ruwenzori, 6000-7000 feet, 1906.

Carcinops lauta, Zimm. Tr. Amer. Ent. Soc. p. 253 (1869).

“Oval, convex, very shining, piceous; antennæ and legs ferruginous; head and thorax finely and sparsely punctured, punctures of different sizes; marginal stria of prothorax very fine, scarcely obvious in front; elytra with the sutural stria feeble, composed only of separate punctures and abbreviated in front, five dorsal striæ entire, slightly curved inwards and distinctly punctured; the inner lateral stria is well developed and finer than the dorsal striæ; pygidium and propygidium

smooth; mesosternum deeply emarginate in front and surrounded by a fine stria; front tibiæ 2-toothed.

"L. $\frac{3}{4}$ line.

"*Hab.* North Carolina."

Horn, in his 'Synopsis,' 1873, p. 308, says the pygidia are punctulate.

Echinodes decipiens, Horn, Tr. Amer. Ent. Soc. x. p. 286 (1883).

"Broadly oval, piceous, brown, moderately shining. Head smooth, obtusely carinate at middle, deeply impressed on each side. Thorax shining, surface with sparsely placed, slightly muricate punctures, each bearing a short erect hair. Elytra with a marginal and three vaguely impressed entire striæ at the side, each with a single row of coarse and closely placed punctures bearing a short erect hair; between these striæ and the suture are four series of punctures rather irregularly placed, bearing setæ, the sutural row the most distinct. Propygidium and pygidium shining, sparsely punctate. Body beneath shining, smooth. Prosternum bicarinate, the carinæ divergent posteriorly. L. .06 inch; 1.5 millim.

"The species resembles *E. setiger*, Lec., and is but a little longer. It differs in the elytral sculpture. The present species has the outer striæ more impressed, the inner rows of punctures single, while in *setiger* the outer striæ are less impressed and the inner rows composed of two or more series of punctures.

"Collected by H. K. Morrison in Arizona."

Saprinus ovillum, Sols. Reis. Fedesch. Turkestan, ii. p. 240 (1876).

"Oblongo-ovatus, convexus, piceo-niger, supra nigro-æneus, nitidus, antennis pedibusque piceis. Fronte crebre punctata, antice obsolete transversim carinata, stria nulla. Pronoto transverso, basi leviter rotundato, vix bisinuato, lateribus rotundato, antrorsum angustato, convexo, disco basin versus subtiliter et minus crebre, ceterum crebre, minus subtiliter punctato; stria marginali integra. Elytris apice ad suturam subtiliter disperse punctatis, stria suturali integra, antice cum quarta dorsali arcuatim conjuncta, dorsalibus paulo pone medium abbreviatis, 1 et 2 subbrevioribus, subhumerali interna cum humerali conjuncta, postice abbreviata, externa nulla. Pygidio crebre punctato. Prosterno stria parallelis, apice confluentibus. Tibiis anticis 5-dentatis, dentibus tribus ultimis fortibus.

"L. $2\frac{2}{3}$ mill."

Hab. "In Valle Sarafschan."

LXVI.—*Descriptions of Three new Freshwater Fishes discovered by Mr. G. L. Bates in South Cameroon.* By G. A. BOULENGER, F.R.S.

Nannocharax ocellicauda.

Depth of body $4\frac{1}{2}$ to 5 times in total length, length of head 4 times. Head twice as long as broad, deeper than broad; snout rounded, feebly projecting, a little shorter than eye, which equals length of postorbital part of head and interorbital width. Gill-rakers short and few. Dorsal III 9–10, originating above root of ventrals, equally distant from eye and from root of caudal; longest ray about $\frac{3}{4}$ length of head. Anal III 9. Pectoral much shorter than head, not reaching root of ventral. Lobes of caudal acutely pointed. Caudal peduncle once and $\frac{1}{2}$ as long as deep. Scales $50\frac{6\frac{1}{2}}{8\frac{1}{2}}$, 5 between lateral line series and root of caudal; lateral line incomplete, reduced to a few tubercles. Yellowish in spirit, with a large black, light-edged ocellus at the root of the caudal fin; vertical fins greyish, dorsal black in front.

Total length 35 mm.

Two specimens from the Ja River.

This fish brings up to nine the number of species of *Nannocharax*. I have prepared the following synopsis for their distinction:—

I. Dorsal originating above ventrals, with 9 to 11 branched rays.

A. Lateral line complete.

1. Less than 50 scales in lateral line, $4\frac{1}{2}$ in transverse series above lateral line; length of head $3\frac{2}{3}$ to 4 times in total length.

Head not deeper than broad; depth of body $5\frac{1}{3}$ to $5\frac{1}{2}$ times in total length; pectoral as long as head, extending beyond root of ventral; Sq. 42–46 $\frac{4\frac{1}{2}}{7\frac{1}{2}}$. [(Gold Coast, Gaboon, Congo). 1. *N. fuscatus*, Gthr., 1867]

Head deeper than broad; depth of body $4\frac{1}{2}$ to 5 times in total length; pectoral as long as head, extending beyond root of ventral; Sq. 37–38 $\frac{4\frac{1}{2}}{6\frac{1}{2}}$. 2. *N. brevis*, Blgr., 1902 (Congo).

Head deeper than broad; depth of body $3\frac{3}{4}$ to $4\frac{1}{4}$ times in total length; pectoral much shorter than head, not reaching root of ventral; Sq. 38–40 $\frac{4\frac{1}{2}}{6\frac{1}{2}}$. [(Ogowe). 3. *N. parvus*, Pellegr., 1907]

2. 47 scales or more in lateral line, $5\frac{1}{2}$ in transverse series above lateral line; length of head 4 to 5 times in total length.

Head deeper than broad; depth of body

5 to $5\frac{1}{2}$ times in total length; pectoral as long as head or slightly shorter, reaching a little beyond origin of ventral; Sq. 47-55 $\frac{5\frac{1}{2}-6}{6\frac{1}{2}-7\frac{1}{2}}$... 4. *N. intermedius*, Blgr., 1903 [(Cameroon).]

Head not deeper than broad; depth of body 5 to 6 times in total length; pectoral shorter than head; Sq. 50-55 $\frac{5\frac{1}{2}}{7\frac{1}{2}}$ 5. *N. niloticus*, Joann., 1835 [(Nile).]

Head not deeper than broad; depth of body $6\frac{1}{2}$ to $7\frac{1}{2}$ times in total length; pectoral shorter than head; Sq. 52-57 $\frac{5\frac{1}{2}}{7\frac{1}{2}}$ 6. *N. elongatus*, Blgr., 1900 [(Congo).]

B. Lateral line incomplete, reduced to a few tubercles; Sq. 50 $\frac{6\frac{1}{2}}{8\frac{1}{2}}$; length of head 4 times in total length.

7. *N. ocellicauda*, Blgr., 1907 [(Cameroon).]

II. Dorsal originating well in advance of ventrals, with 11 or 12 branched rays; head deeper than broad, 4 to $4\frac{1}{3}$ times in total length; depth of body $4\frac{1}{2}$ to 5 times in total length; pectoral shorter than head.

Sq. 48-49 $\frac{5\frac{1}{2}-6}{7\frac{1}{2}}$ 8. *N. tania*, Blgr., 1902 (Congo)

Sq. 52 $\frac{7\frac{1}{2}}{10\frac{1}{2}}$ 9. *N. dimidiatus*, Pellegr., 1904 [(Casamanza).]

Barbus callipterus.

Depth of body 3 to $3\frac{1}{3}$ times in the total length, length of head $3\frac{1}{2}$ to $3\frac{2}{3}$ times. Snout rounded, not longer than eye, the diameter of which is $2\frac{2}{3}$ to 3 times in length of head and equals interorbital width; mouth terminal; lips moderately developed, interrupted on the chin; barbels two on each side, subequal, $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye. Dorsal III 8, last simple ray flexible, not enlarged, nearly as long as head; free edge of fin slightly concave; its distance from occiput less than its distance from caudal fin. Anal III 5, longest ray $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Pectoral a little shorter than head, not reaching ventral; latter below anterior half of dorsal. Caudal peduncle about once and $\frac{1}{2}$ as long as deep. Scales 25-26 $\frac{3\frac{1}{2}}{3\frac{1}{2}}$, 2 between lateral line and ventral, 8 or 10 round caudal peduncle. Yellow, brownish on the back, the dorsal and lateral scales dark brown at the base; dorsal fin orange in the basal half, white in the distal half, with a large deep black spot between the last simple ray and the third branched ray; other fins white, the caudal orange at the base.

Total length 73 mm.

Four specimens from Akok, Kribi River.

Mastacembelus longicauda.

Depth of body 24 times in total length, length of head (without rostral appendage) 11 times. Vent much nearer end of snout than base of caudal fin. Length of head 4 times in its distance from vent and a little greater than its distance from first dorsal spine. Snout 4 times as long as eye, ending in a trifid appendage, which is not quite twice as long as eye; cleft of mouth extending to below anterior border of eye; no præorbital spine; two strong præopercular spines. Vertical fins united with the very short, broadly rounded caudal. Dorsal XXVII 150; last spine once and $\frac{1}{2}$ diameter of eye. Anal II 150*. Pectoral one fourth length of head. 14 series of scales between origin of soft dorsal and lateral line. Brown above, yellow beneath; a dorsal series of small dark brown spots; sides with lighter spots, some of which are ocellar; end of tail with large dark brown spots.

Total length 305 mm.

A single specimen from Akok, Kribi River.

Allied to *M. Greshoffi*, Blgr., from the Congo, but form more elongate, caudal fin more rounded, and no præorbital spine.

LXVII.—*Descriptions of Three new Fishes from Central Africa.* By G. A. BOULENGER, F.R.S.

Petersius Woosnami.

Depth of body equal to length of head, 4 times in total length. Head longer than deep, with convex upper profile; lower jaw projecting slightly beyond upper; diameter of eye equal to length of snout, 3 times in length of head; maxillary not extending to below anterior border of eye; 14 teeth ($\frac{6}{8}$) in the upper jaw, 8 in the lower; outer præmaxillary teeth tricuspid, inner multicuspid and inserted directly behind the outer. Gill-rakers short, 12 on lower part of anterior arch. Dorsal III 8, originating above base of ventrals and at equal distance from end of snout and from root of caudal; longest ray about $\frac{3}{4}$ length of head. Adipose fin very small. Anal III 17–18. Pectoral shorter than head, not reaching ventral.

* The numbers of soft rays are approximative, the vertical fins of the unique specimen being rather stiff, rendering the counting of the rays very difficult.

Caudal peduncle as long as deep. Scales 29-30 $\frac{4\frac{1}{2}}{3\frac{1}{2}}$, 2 between lateral line and ventral. No markings, except a silvery lateral band, which is black-edged above.

Total length 70 mm.

Two specimens from the Aruwimi, in the Congo Forest, form part of the collection made by Mr. R. B. Woosnam and presented to the British Museum by the Subscribers to the Ruwenzori Expedition Fund.

In its dentition this new species stands nearest to *P. occidentalis*, Gthr., in which the body is much shorter and the lateral line incomplete.

Barbus Johnstonii.

Depth of body equal to length of head, 4 times in total length. Snout rounded, a little longer than the eye, the diameter of which is $4\frac{1}{3}$ times in length of head; interorbital width $2\frac{1}{2}$ times in length of head; mouth inferior, its width 3 times in length of head; lower jaw with a blunt edge, covered by a thin horny sheath; lips feebly developed, lower confined to the sides; barbels two on each side, posterior slightly longer than the anterior and as long as the eye. Dorsal IV 9, last simple ray flexible, not enlarged, as long as head; free edge of fin deeply concave; its distance from centre of eye equals its distance from caudal fin. Anal III 5, longest ray $\frac{2}{3}$ length of head. Pectoral slightly shorter than head, not reaching ventral; latter below middle of dorsal. Caudal peduncle once and $\frac{3}{4}$ as long as deep. Scales 38 $\frac{6\frac{1}{2}}{5\frac{1}{2}}$, 3 between lateral line and ventral, 14 round caudal peduncle. Silvery, darker on the back.

Total length 180 mm.

A single specimen from British Central Africa, between Kondowe and Karonga, was presented by Sir Harry Johnston in 1897.

B. rhodesianus, Blgr., which has a similar mouth (approaching the *Capoëia* type), is distinguished by its larger scales (30-32 $\frac{5\frac{1}{2}}{5\frac{1}{2}}$) and its shorter barbels.

Amphilius Hargeri.

Depth of body $5\frac{1}{2}$ times in total length, length of head $3\frac{2}{3}$ times. Head slightly longer than broad; eyes small, in the middle of the length of the head, 3 diameters apart; interorbital width $\frac{5}{6}$ length of snout; latter broadly rounded, projecting but slightly beyond lower jaw; posterior nostril

midway between eye and end of snout; præmaxillary teeth forming a short crescentic band; maxillary barbel once and $\frac{1}{2}$ length of head; outer mandibular barbel $\frac{2}{3}$ length of head, inner $\frac{1}{2}$. Dorsal I 6, well in front of vertical of ventrals, but nearer latter than base of pectorals, equally distant from end of snout and from middle of adipose fin; first branched ray $\frac{2}{3}$ length of head. Adipose fin low, 5 times as long as deep, twice as long as rayed dorsal. Anal II 7, a little nearer root of caudal than base of ventral. Pectoral longer than ventral, a little shorter than head. Caudal feebly emarginate. Caudal peduncle as long as deep. Dark olive above, whitish beneath; five round whitish spots on the back—one in front of the dorsal fin, one on each side of the last rays of the dorsal, one in front of the adipose fin, and one on the posterior extremity of the latter.

Total length 60 mm.

A single specimen from Mlanji, British Central Africa, presented by Mr. R. L. Harger.

Closely allied to *A. platycheir*, Gthr., which occurs also in British Central Africa, but body shorter and barbels longer.

LXVIII.—*Description of a new African Snake of the Genus Simocephalus.* By G. A. BOULENGER, F.R.S.

Simocephalus Butleri.

Eye moderately large. Rostral once and a half as broad as deep, the portion visible from above measuring one third its distance from the frontal; internasals once and a half as broad as long, half the length of the præfrontals, which are nearly as long as the frontal; frontal slightly longer than broad, as long as its distance from the end of the snout, shorter than the parietals; loreal deeper than long; one præ- and three postoculars; the lower of the latter may be regarded as a subocular; temporals 1 + 2, the first narrowly separating, in front, the parietal from the fifth labial; seven upper labials, third and fourth entering the eye; five lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales in 15 rows, strongly keeled, with secondary tubercular keels. Ventrals 232; anal entire; subcaudals 58. Black above, each scale with a whitish basal spot, white beneath; ventrals edged with black on the sides; lower surface of tail greyish.

Total length 400 mm.; tail 55.

A single female specimen from between Wau and Chak Chak, in the Bahr-el-Ghazal Province, presented to the British Museum by Mr. A. L. Butler.

This snake appears to be most nearly related to *S. Chanleri*, described by Dr. Stejneger from a specimen in bad condition obtained at the mouth of the Tana River, British East Africa. But the proportions of the head-shields and the coloration are too different to justify me in referring the Bahr-el-Ghazal specimen to that species.

LXIX.—*Descriptions of new Species of Land and Fresh-water Shells from Central and South America.* By H. B. PRESTON, F.Z.S.

Polita peruviana, sp. n. (Fig. 1.)

Shell somewhat depressed, thin, pale brownish horn-colour; whorls $4\frac{1}{2}$, sculptured with transverse, arcuate striæ; sutures deeply impressed; umbilicus wide and deep; peristome simple; aperture lunate.

Alt. 3.25, diam. maj. 7.25 mm.

Aperture: alt. 2, diam. 1.5 mm.

Hab. Chanchamayo, Peru.

Closely allied to *P. insignis*, D'Orb. *, which occurred with it; *P. peruviana* is, however, not so depressed and of a darker colour, the umbilicus is also rather narrower and the sutures though well defined do not present the almost channelled appearance which is the case with *P. insignis*.

Stephanoda bogotensis, sp. n. (Fig. 2.)

Shell orbicular, somewhat depressed, dark brown, showing traces of having been covered with a hairy periostracum; whorls $5\frac{1}{2}$, sculptured with fine, arcuate, transverse, and very minute spiral striæ; umbilicus very wide and deep; aperture lunate.

Alt. 4, diam. maj. 8 mm.

Aperture: alt. 2.5, diam. 1 mm.

Hab. Bogota, United States of Colombia.

Pleurodonte (Labyrinthus) Da Costiana, sp. n. (Fig. 3.)

Shell thin, subdepressed, carinate, pale brownish horn-colour; whorls $4\frac{1}{2}$, obliquely striate with lines of growth and

* Voy. Amér. Mérid. t. 26. ff. 14-17.

minutely granular; sutures impressed; umbilicus broad and deep; peristome continuous, reflexed; aperture irregularly auriform, a single broad tooth appearing on the parietal wall and two teeth on basal margin, the inner strong and simple, the outer not so strong and bifid.

Alt. 13, diam. maj. 29.75 mm.

Aperture: alt. (including peristome) 10, diam. 14.5 mm.

Hab. Chanchamayo, Peru.

Allied to *L. Garbei*, Hidalgo, but much larger, more depressed, less solid, and more finely granular than that species; it shows no traces of spiral striæ and, moreover, has a wider umbilicus.

Bulimulus (Drymæus) carandaitiensis, sp. n. (Fig. 4.)

Shell narrowly perforate, fusiform, white, painted with longitudinal bands of brown varying in shade from pale reddish brown to dark chestnut; whorls $9\frac{1}{2}$, convex, marked with fine longitudinal lines of growth; sutures well impressed, subcrenulate; aperture inversely auriform; peristome simple; columella descending obliquely, reflexed above, thus partly concealing the umbilicus.

Alt. 35, diam. maj. 14 mm.

Aperture: alt. 14, diam. 6 mm.

Hab. Carandaiti, province of Cordillera, Bolivia, 1000 metres.

Bulimulus (Drymæus) chacoensis, sp. n. (Fig. 5.)

Shell narrowly perforate, subulately fusiform, cream-coloured, painted with irregular longitudinal bands varying in breadth and in shade from pale brownish horn-colour to dark chestnut; whorls 9, flattish, smooth; sutures impressed; aperture elongately oval; peristome simple, acute; columella descending somewhat obliquely and reflexed over the narrow umbilicus.

Alt. 30, diam. maj. 9.5 mm.

Aperture: alt. 10.75, diam. 3 mm.

Hab. To the north of the Rio Pilcomayo, Chaco, Bolivia, 600 metres.

Bulimulus (Drymæus) nigroumbilicatus, sp. n. (Fig. 6.)

Shell subperforate, fusiform, yellowish white, painted with longitudinal, arcuate, deep brown and blackish bands, umbilical area deep blackish brown; whorls 8, rather flat, marked with lines of growth and fine, wavy, spiral striæ, the

Fig. 1.

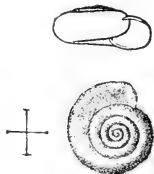
*Polita peruviana.*

Fig. 2.

*Stephanoda bogotensis.*

Fig. 3.

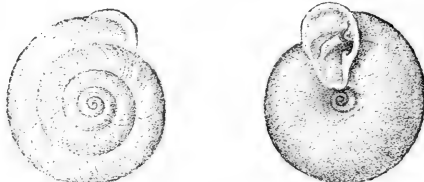
*Pleurodonte (Labyrinthus) Da Costiana.*

Fig. 4.

*Bulimulus (Drymæus) carandaitiensis.*

Fig. 5.

*Bulimulus (D.) chacoensis.*

Fig. 6.

*Bulimulus (D.) nigroumbilicatus.*

Fig. 8.

*Bulimulus (D.) comis.*

Fig. 9.

*Bulimulus (D.) solidus.*

Fig. 7.

*Bulimulus (D.) Morenoi.*

Fig. 10.



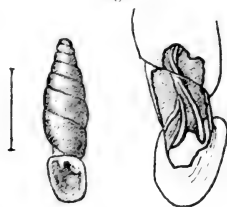
*Bulimulus (D.)
ventricosus.*

Fig. 11.



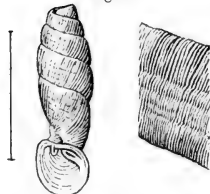
*Bulimulus (D.)
vicinus.*

Fig. 12.



*Clausilia (Nenia)
chunchamayoensis.*

Fig. 13.



*Clausilia (Nenia) Slosarskii,
var. Rosenbergi.*

Fig. 14.



*Stenogyra
colombiana.*

Fig. 15.



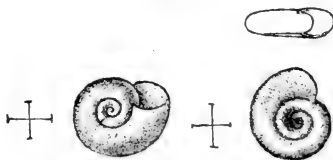
Limnea Selli.

Fig. 16.



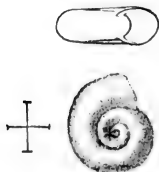
*Planorbis
costaricensis.*

Fig. 17.



Planorbis Bowardiana.

Fig. 18.



*Planorbis
meridaensis.*

Fig. 19.



Physa balteata.

Fig. 20.



Physa cornea.

latter especially noticeable on the lower half of the body-whorl; sutures impressed; aperture receding towards the base, narrowly, inversely auriform; columella expanded over the very narrow umbilical perforation; peristome simple.

Alt. 26.5, diam. maj. 9.5 mm.

Aperture: alt. 10.25, diam. 4 mm.

Hab. To the north of the Rio Pilcomayo, Chaco, Bolivia, 600 metres.

Bulimulus (Drymæus) Morenoi, sp. n. (Fig. 7.)

Shell ovate conic, narrowly perforate, pale yellowish white; whorls $6\frac{1}{2}$, convex, marked with lines of growth and showing traces of very fine spiral striæ; sutures impressed and irregularly crenulate with lines of growth; aperture acuminate, oval; peristome simple; columella descending somewhat obliquely and reflexed over the umbilical region.

Alt. 23.5, diam. maj. 11 mm.

Aperture: alt. 10.5, diam. maj. 5 mm.

Hab. Argentina.

Bulimulus (Drymæus) comis, sp. n. (Fig. 8.)

Shell narrowly fusiform, smooth, milk-white, painted on the lower portion of the whorls with transverse bands of purplish and greyish black; whorls 6, marked with very fine lines of growth; sutures impressed; umbilicus narrow; aperture inversely auriform; peristome thin, expanded especially below; *columella twisted into a fold*, and diffused into a pale purple callus which reaches the lip above; interior of shell pale purple.

Alt. 28, diam. maj. 12 mm.

Aperture: alt. 11.5, diam. 5.5 mm.

Hab. Bogota, United States of Colombia.

Bulimulus (Drymæus) solidus, sp. n. (Fig. 9.)

Shell fusiform, *rather solid*, very narrowly perforate, smooth, polished, cream-coloured, painted with two interrupted spiral bands of greyish black and five wavy transverse lines and streaks of greyish purple; whorls $5\frac{1}{2}$, slightly convex; sutures impressed; aperture ovate, *somewhat oblique*; *peristome white, rather thick*, slightly reflexed; columella descending obliquely and reflexed over the very narrow umbilicus, white below, purple above and diffused into a purple callus which joins the upper margin of the lip; interior of shell purple.

Alt. 32.5, diam. maj. 15 mm.

Aperture: alt. 14, diam. 6 mm.

Hab. Bogota, United States of Colombia.

Bulimulus (Drymæus) ventricosus, sp. n. (Fig. 10.)

Shell fusiform, *rather tumid*, smooth, pale flesh-colour, painted with transverse streaks of reddish and purplish brown and with two interrupted bands of brownish black, which increase to three on the last whorl; whorls $5\frac{1}{2}$, flattish; sutures impressed; aperture inversely auriform; peristome thin, white, reflexed; columella slightly arched, reflexed outwards over the narrow perforation and diffused into a purple callus which reaches the lip above.

Alt. 34.75, diam. maj. 16.5 mm.

Aperture: alt. 17, diam. 7 mm.

Hab. Bogota, United States of Colombia.

Bulimulus (Drymæus) vicinus, sp. n. (Fig. 11.)

Shell fusiform, narrowly perforate, smooth, yellowish fawn-colour, with occasional transverse streaks of a darker shade; whorls $5\frac{1}{2}$, marked with somewhat coarse growth-lines; sutures impressed, faintly crenulate with the lines of growth; aperture ovate, *much contracted below*; peristome white, slightly reflexed; columella somewhat oblique and spreading into a purple callus which reaches the lip above; interior of shell mauve.

Alt. 33, diam. maj. 15 mm.

Aperture: alt. 13.5, diam. 6 mm.

Hab. Bogota, United States of Colombia.

Clausilia (Nenia) chanchamayoensis, sp. n. (Fig. 12.)

Shell fusiform, rather thin, light brown, streaked and mottled with greyish white; whorls 7, finely and closely transversely striate; sutures well impressed; aperture ovate, oblique; peristome expanded, reflexed above; lamella superior strong and reaching to the outer edge of the peristome; lamella inferior not so strong and reaching only to the inner edge of the peristome.

Alt. 13, diam. maj. 3 mm.

Aperture (including peristome): alt. 3.75, diam. 2.75 mm.

Hab. Chanchamayo, Peru.

Clausilia (Nenia) Slosarskii, Lub., var. *Rosenbergi*, var. n.
(Fig. 13.)

More coarsely transversely striate and much less closely spirally striate than is the typical form.

Hab. Pozuzo, Peru, 800 metres.

Among the fifteen specimens examined there appears to be a good deal of difference in the diameter of the shell, and I was at first inclined to think that there might be two distinct species represented; but as they all agree in every other respect, I am satisfied that they all belong to the same form.

Stenogyra colombiana, sp. n. (Fig. 14.)

Shell subperforate, fusiform, vitreous, pale straw-colour; apex obtuse; whorls $6\frac{1}{2}$, sculptured with very fine transverse costæ; sutures impressed, subcrenulate, and discoloured with a narrow band of reddish brown, which appears to be painted on the interior of the shell; columella descending perpendicularly, slightly excavated and joined to the lip above by a very thin callus.

Alt. 28.5, diam. maj. 12 mm.

Hab. Bogota, United States of Colombia.

Limnea Selli, sp. n. (Fig. 15.)

Shell ovate, thin, semipellucid, light brownish horn-colour; whorls 4, sculptured with very minute punctate spiral striæ or scratches and fine transverse lines of growth; sutures impressed; aperture ovate, rather dilated below; peristome simple; columella descending obliquely, reflexed outward, thus partly concealing the narrow perforation and spreading above into a thick callus which reaches the upper margin of the peristome.

Alt. 12, diam. maj. 7 mm.

Aperture: alt. 7, diam. 3.5 mm.

Hab. Bogota, United States of Colombia.

Planorbis costaricensis, sp. n. (Fig. 16.)

Shell pale brown, corneous, depressed, concave both above and below; whorls 4-5, sculptured with coarse oblique lines of growth, the body-whorl inflated and extending upwards and outwards towards the aperture; aperture obliquely lunate; peristome acute, bent slightly outwards, a callus uniting the points of contact with the whorl.

Alt. maj. 9.5, diam. maj. 26 mm.

Aperture: alt. 9, diam. 6 mm.

Hab. Catalina, Province of Guanacaste, Costa Rica.

This shell is in many respects allied to *P. guadeloupensis*, Sow., but is much more inflated than is the case with that species, and there are no traces of a peripheral keel; more-

over the upward extension of the last whorl near the aperture, so noticeable in the present species, is totally lacking in *P. guadeloupensis*.

Planorbis Boucardiana, sp. n. (Fig. 17.)

Shell depressed, subcarinate, whitish grey; whorls 4, sculptured with fine oblique striæ; spire concave; umbilicus wide, very concave, especially in the centre; peristome simple, very oblique, broadly lunate.

Alt. 2, diam. maj. 7 mm.

Aperture: alt. 2, diam. 1.25 mm.

Hab. Mexico.

Planorbis meridaensis, sp. n. (Fig. 18.)

Shell depressed, suborbicular, dull brown; whorls $3\frac{1}{2}$, marked with oblique arcuate lines of growth; right side deeply excavated, especially in the middle; left side somewhat concave; peristome acute, a callus on the parietal whorl joining the two margins of the peristome; aperture obliquely lunate.

Alt. 3, diam. maj. 8 mm.

Aperture: alt. 3, diam. 1.5 mm.

Hab. Merida, Venezuela.

Physa balteata, sp. n. (Fig. 19.)

Shell fusiform, pale yellowish horn-colour, transversely marked with oblique, buff-coloured bands; whorls 6, the last somewhat inflated and sculptured with very fine transverse striæ; sutures rather deeply impressed; edge of peristome acute, a thickening appearing just within the shell; columella straight, white, descending somewhat obliquely, a very thin callus joining it with the lip above; aperture elongately, inversely auriform.

Alt. 12.5, diam. maj. 6.75 mm.

Aperture: alt. 8, diam. 3.5 mm.

Hab. Oaxaca, Mexico.

Physa cornea, sp. n. (Fig. 20.)

Shell fusiform, thin, polished, transversely striated with irregular and somewhat distant lines of growth and spirally sculptured with very fine wavy striæ; whorls $5\frac{1}{2}$; sutures impressed; peristome acute; columella twisted, descending

somewhat abruptly, a light callus joining it with the lip above; aperture elongately, inversely auriform.

Alt. 11·5, diam. maj. 6 mm.

Aperture: alt. 7·5, diam. 3 mm.

Hab. Merida, Venezuela.

Allied to *P. venezuelensis*, Mart.; it is, however, separable from that species by its more twisted columella and its less opaque texture, it is also more conspicuously transversely striate than is the case with that species. The fine spiral striae mentioned above are only visible by the aid of a strong lens.

LXX.—*A new Acanthoglossus from the Island of Salawatti.*
By OLDFIELD THOMAS.

THE National Museum owes to the generosity of Mr. Walter Goodfellow a fine Long-nosed Echidna which he obtained in the island of Salawatti, and kept alive, with another specimen, for some months.

The genus has not hitherto been recorded out of New Guinea itself, and there mainly or entirely at high altitudes, for which the thick coat present in *A. Bruijnii* admirably suits it. But the island of Salawatti being throughout comparatively low, it is not surprising that the *Acanthoglossus* occurring there should be different in the development of its coat from its New Guinea ally.

I would propose to call the new form

Acanthoglossus Goodfellowi, sp. n.

Coat much more spinous and less hairy than in any of the forms of *A. Bruijnii*. Spines extending on the under surface nearly to the middle line of the belly, and though absent in the groin and between the fore limbs they reappear on the chest and throat to the middle line, though small and far apart. In *A. Bruijnii* the under surface is without spines throughout.

Spines of upper surface averaging about an inch in length and 2·5 mm. in thickness, the longer ones attaining 30 mm. with a thickness of 3 mm.; the small spines of the chest and belly about 12 × 1 mm. In colour all over the body they are white, shading basally into grey. Fur short and scanty, the skin and bases of the spines not hidden; the hairs only about half an inch in length; uniformly black throughout. On the

chest and groin the hairs are coarse and bristly, blackish on the former, yellowish grey on the latter. Hands and feet thinly covered with short coarse bristles. Claws 3—3, as usual*.

Skull without marked special characters, its dimensions as follows :—

Greatest breadth 53 mm.; palate length 160; length of rostrum 119; palatal foramina 37.5.

Hab. Island of Salawatti, N.W. of New Guinea.

Type. Old female. B.M. no. 7. 9. 5. 1. Collected October 1906, and presented by Walter Goodfellow, Esq.

The predominance of the spines and the almost entire suppression of the woolly coat will readily distinguish the Salawatti form from its thickly clothed New Guinea ally.

LXXI.—*Description of a new Baboon from British East Africa.* By D. G. ELLIOT, D.Sc., F.R.S.E., &c.

Family Cercopithecidae.

Genus PAPIO.

Papio furax, sp. n.

Type locality. Baringo, North-west of Mt. Kenia, East Africa.

Gen. char. Resembles *P. doguera* from Abyssinia, but darker and cranial characters very different. The rostrum is shorter and much broader and flatter, and the nasals do not rise above the plane of the rostrum, but are flat, not rounded; the palate is flatter and the distance between the last molar and the palatal arch is much greater; the intertemporal width is much less, as is also the width of the brain-case; the pit on the side of the jaw is broader, shorter, not so deep, and the zygomatic width much less.

Colour. General colour seal-brown, the hairs banded with buff, becoming ochraceous buff on the rump; the black tips of the hairs so arranged over the ochraceous buff as to form bands of black, though not distinctly defined; limbs black and cream-colour, the hairs having bands of those colours with black tips; chest black and cream-colour; abdomen

* When describing *A. B. Bartoni*, I omitted to mention that the type had no less than five claws on both fore and hind feet; but considerable variation in this respect has already been recorded.

black, the hairs banded with ochraceous buff; hands mixed black and ochraceous buff; feet black, with the base of the hairs buff; tail mixed black and whitish yellow.

Measurements. Size about the same as *P. doguera*. Skull: total length 196 mm.; occipito-nasal length 166; hensel 141; intertemporal width 56; zygomatic width 122; palatal length 93; breadth of brain-case 82; length of nasals 77; length of upper molar series 48; length of mandible 145; length of lower molar series 65.

Type. Adult male in British Museum. No. 1. 8. 9. 20. Presented by Sir H. H. Johnston.

Two specimens were procured by Sir H. H. Johnston, one at Baringo and one at Nandi, north of Mt. Kenia. Compared with Abyssinian examples of *P. doguera* the present species is a much darker animal and the bands on the hairs are paler and more yellow, those of *P. doguera* being more ochraceous, with less of the black showing. The general tone of the Baringo specimen, while seal-brown, has a greyish tinge, while that of Abyssinian examples is more ochraceous. The cranial characters, however, will easily distinguish the present form from its ally.

I am indebted to my friend Mr. Oldfield Thomas for the privilege of describing the species.

LXXII.—*List of a Collection of small Mammals made by Mr. A. L. Butler in the Bahr-el-Ghazal.* By R. C. WROUGHTON.

THE following is a list of the small mammals collected by Mr. Butler between Renk, on the White Nile, and Dem Zubeir, in the Bahr-al-Ghazal. The collection, though small, was obtained under trying conditions. It is of special interest, not so much on account of the new forms it contains, as that it was made in a region whence little has been brought since Heuglin's collection nearly fifty years ago.

1. *Epomophorus anurus*, Heug.

♂. 50; ♀ (?). 51. Dad Majok. 29. iii. 07.
Topotypes of Heuglin's species.

2. *Lavia frons affinis*, And. & Wrought.

♂. 1; ♀. 2. Renk, White Nile. 7. i. 07.

3. *Chærophon* sp.

♀. 3. Gamai Za. 6. i. 07.

4. *Crocidura sericea*, Sund.

♂. 41, 45; ♀. 40, 44. Chak Chak. 13. iii. 07.

5. *Crocidura* sp.

♂. 33. Between Chak Chak and Dem Zubeir. 7. iii. 07.

6. *Funisciurus multicolor*, Rüpp.

♂. 11. Kátha (Khor Gitti). 31. i. 07.

♂. 43. Chak Chak. 13. iii. 07.

7. *Xerus erythropus leucombrinus*, Rüpp.

♂. 22; ♀. 20. Chak Chak. 22/24. ii. 07.

8. *Tatera Emini*, Thos.

♂. 5, 6; ♀. 4, 10 (juv.). Chak Chak. 19. i. 07.

9. *Tatera macropus*, Heug.

♂. 46; ♀. 15, 23 (juv.). Chak Chak. ii. 07.

10. *Tatera robusta*, Wagn.

♂. 30; ♀. 31. Halfway between Chak Chak and Dem Zubeir. 3. iii. 07.

11. *Mus* sp. (multimammate).

♀. 9. Moyen. 21. i. 07.

♀. 12. Kátha. 31. i. 07.

♂. 26, 42; ♀. 13, 14. Chak Chak. 13/16. iii. 07.

12. *Mus alghaza'*, sp. n.

♂. 24, 27. Chak Chak. 24/25. ii. 07.

♂. 28, 36. Between Chak Chak and Dem Zubeir. 2/9. iii. 07.

A rat rather smaller than *M. Hindei*, Thos.

Fur soft and silky, about 10 mm. long on the back. General colour above dull tawny (near "russet"), the hairs slate-grey for basal two thirds, then "ochraceous buff," a considerable proportion of somewhat longer wholly black

hairs scattered among the rest; underside white, basal fourth of hairs slaty. Head and face like back, but a bright buff patch on cheek below eye. Upper lip and chin white like belly. Hands and feet pure white. Tail sparsely clad; rings 8=10 mm.

Skull markedly smaller in all details than that of *M. Hindei*, except the teeth, which are about the same size.

Dimensions of the type:—

Head and body 147 mm.; tail 156; hind foot 28; ear 16.

Skull: greatest length 36; basilar length 29; greatest breadth 18; nasals 14; interorbital breadth 5.5; brain-case breadth 14.5; diastema 9.5; length of upper molar series 6; bullæ 7.

Hab. Chak Chak, Bahr-el-Ghazal.

Type. Adult male. Collector's number 24. Taken 25th February, 1907.

Four specimens (unfortunately all males) examined.

13. *Mus Blainei*, sp. n.

♀. 7, 8. Ayum. 4. i. 07.

♀. 19. Chak Chak. 22. ii. 07.

♂. 39. Between Chak Chak and Dem Zubeir. 9. iii. 07.

♂. 47. Between Chak Chak and the Pongo. 19. iii. 07.

A small soft-furred mouse with a rather short tail.

Size about as in *M. Alleni* and *M. Dennie*, but with a quite short tail.

Fur soft and silky, about 10 mm. long on the back.

General colour above "isabella," the hairs slate-colour from their bases for three fourths their length, terminal fourth pale orange-buff with black tips; underside white, the basal half of hairs slate-colour. Face below the eyes, sides of neck, and flanks "orange-buff" with a mixture of "vinaceous buff"; chin and upper lip white; hands and feet white; tail sparsely haired, darker above than below, with about 2 rings=1 mm.

Skull and teeth of the usual type in *Mus*.

Dimensions of the type:—

Head and body 100 mm.; tail 103; hind foot 22; ear 20.

Skull: greatest length 28; basilar length 22; greatest breadth 13.5; nasals 10; interorbital breadth 4.3; brain-case breadth 11.3; diastema 7.8; length of upper molar series 4.5; bullæ 5.

Hab. Chak Chak, Bahr-el-Ghazal.

Type. Young female. Collector's number 19. Taken 22nd February, 1907.

Five specimens examined.

I have named this species after Mr. Gilbert Blaine, who was Mr. Butler's companion on the tour during which the collection was made.

14. *Mus Butleri*, sp. n.

♀. 37. Between Chak Chak and Dem Zubeir. 8. iii. 07.

A mouse rather smaller than the last, with a longer tail and pure white belly.

Size rather smaller than *M. Blainei*.

Fur soft and silky; 6-8 mm. long on the back.

General colour above "clay-colour," the hairs slate-colour from their bases for two thirds their length, terminal third a bright fawn, with short black tips; underside pure white, the hairs white to their bases; face below the eyes and sides of the neck and body fawn; line between upper and belly colours sharply defined; feet white; tail sparsely haired, darker above than below, about 7-8 rings=5 mm.

Skull and teeth of the type normal in the genus *Mus*.

Dimensions of the type:—

Head and body 90 mm.; tail 118; hind foot 20; ear 16.

Skull: greatest length 27; basilar length 21; greatest breadth 13; nasals 10; interorbital breadth 4; brain-case breadth 12; diastema 7; length of upper molar series 4.5; bullæ 5.

Hab. Between Chak Chak and Dem Zubeir, Bahr-el-Ghazal.

Type. Young female. Collector's number 37. Taken 8th March, 1907.

Though the size and proportions of the skull are so similar in the two species, the present form is separable at once from the last by its proportionally much longer tail and snow-white belly. The species most closely resembling this one is perhaps *M. Denniae*, Thos., from Ruwenzori; but in that animal the tail is proportionally still longer and the slaty bases of the hairs of its underside distinguish it markedly from *M. Butleri*.

15. *Arvicanthis zebra*, Heugl.

♂. 48, 49. Dad Majok. 30. iii. 07.

Topotypes of Heuglin's species.

16. *Arvicanthis* sp.

♂. 34, 35, 38. Between Chak Chak and Dem Zubeir.
7/9. iii. 07.

17. *Thamnomys Macmillani*, sp. n.

♂. 21, 25. Chak Chak. 24. ii. 07.

A small *Thamnomys* of the *T. arborarius* group.

Size as in *T. arborarius*.

Fur soft and silky, about 10 mm. long on back.

General colour above a dark "olive-buff," with a good deal of ochraceous colouring on the median line, especially bright on the rump, basal three fourths of hairs dark slate; underside pure white, the hairs white to their bases. Feet pale buff. Tail dark, pale below for basal half; 17 rings = 10 mm.; sparsely clothed with dark hairs; hairs short for basal half of tail, then lengthening to 3-4 mm. on terminal fourth.

Skull and teeth as in *T. arborarius*, but markedly smaller in all details judging from Peters's description and figure.

Dimensions of type:—

Head and body 102 mm.; tail 160; hind foot 22; ear 15.

Skull: greatest length 28; basilar length 21; greatest breadth 13·5; nasals 9·5; interorbital breadth 4·3; brain-case breadth 12; diastema 6·7; length of upper molar series 4·3; bullæ 5.

Hab. Wouida, N. of Lake Rudolf. Alt. 6200'.

Type. Adult female. B.M. no. 6. 11. 1. 38. Taken by Mr. Zaphiro on the 30th June, 1905, and presented to the British Museum by Mr. W. N. McMillan.

Two specimens sent by Mr. Butler from Chak Chak are quite like the type in all essential characteristics (their skulls unfortunately are imperfect). The colour-pattern is also similar, but the grey-drab shoulder-patches are even more clearly marked in Mr. Butler's specimens.

18. *Thryonomys Swinderenianus*, Temm.

Skull only. Chak Chak. 1. iii. 07.

19. *Gazella albonotata*, Roths.

No specimen of this striking species had hitherto been obtained by the National Museum.

LXXIII.—*Descriptions of Five new Species of Heterocera.*
By HERBERT DRUCE, F.L.S. &c.

Fam. Castniidæ.

Castnia angusta, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen dark brown; legs blackish brown. Primaries dark brown, bluish at the base; the veins near the outer margin irrorated with pale blue scales; a pale yellow spot at the end of the cell, beyond which a narrow yellow line crosses the wing from the costal to the inner margin near the anal angle; the fringe yellow: secondaries dark brown, shot with blue at the base, crossed beyond the middle by a band of narrow, crescent-shaped, yellow spots, which extend from near the apex to the anal angle; a submarginal row of six rather large round yellow spots, starting from the apex; the fringes of both wings yellow. Underside considerably paler brown: primaries, the yellow band much wider than above, a submarginal row of eight yellow spots extends from the apex to the anal angle; secondaries crossed by two rows of yellow spots, the first below the middle, the second submarginal, on the outer margin the spots are edged with reddish brown.

Expanse $6\frac{1}{2}$ inches.

Hab. Ecuador, Los Lanos (*Mus. Druce*).

Castnia dolopia, sp. n.

Female.—Head, collar, tegulæ, thorax, and base of the abdomen dark brown; abdomen black; antennæ black, the tips pale brown. Primaries dark brown glossed with green; a large greyish-brown spot at the end of the cell, beyond which the wing is crossed from near the apex by a series of dull greyish-brown spots, those nearest the apex very indistinct, the spots are edged with black; below the spots on the inner margin are two lunular-shaped black marks: secondaries black, the base shot with bluish green; a row of brownish-white spots crosses the wing from near the anal angle almost to the apex, the fringe brownish white. The underside of both wings pale brown, with all the spots much more distinct and all edged with black.

Expanse $7\frac{3}{4}$ inches.

Hab. Ecuador, Los Lanos (*Mus. Druce*).

Fam. Thymaridæ.

Pedoptila thaletes, sp. n.

Female.—Head, collar, tegulæ, thorax, and abdomen reddish brown; abdomen banded with black; the antennæ, underside of the abdomen, and the legs black; the anus clothed with greyish hairs. Primaries, the basal half reddish orange, the outer half black, the veins black; secondaries reddish orange as far as the lobe, which is black almost to the end of the wing; the tip of the tail white.

Expanse $1\frac{3}{4}$ inch.

Hab. Cameroons, Ja River (*Mus. Druce*).

Fam. Syntomidæ.

Histiæa falerina, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and base of abdomen black; head and collar spotted with metallic blue; abdomen metallic blue; legs black. Primaries black, the basal half of the wing red streaked with black; a broad oblique yellow band beyond the cell, a metallic-blue spot at the base, and a blue streak at the end of the cell: secondaries red, edged with black, widest at the apex and the middle of the outer margin.

Expanse $2\frac{3}{4}$ inches.

Hab. Peru, Marcapata (*Mus. Druce*).

Fam. Arctiidæ.

Automolis marcapata, sp. n.

Female.—Head, antennæ, collar, tegulæ, thorax, and abdomen reddish yellow; legs reddish. Primaries reddish, irrorated near the base with yellow scales; a large semihyaline yellow blotch at the end of the cell extending to the costal margin; the veins and the edges of the large blotch dark red; the fringe brownish red: secondaries deep pink, the fringe yellowish.

Expanse 2 inches.

Hab. Peru, Marcapata (*Mus. Druce*).

Allied to *Automolis sanguinolenta*, Cram., but very distinct.

LXXIV.—*New African Species of the Genus Chrysops, Meigen, in the British Museum (Natural History).* By ERNEST E. AUSTEN.

THE latest list of African representatives of this genus* includes the names of eighteen species. As stated in the "Notes" at the end of the present paper, however, two of these are synonyms. Six new species are described in the following pages, bringing the number of known African forms of these handsome and bloodthirsty flies up to twenty-two. The Museum collection contains examples of at least two additional species, of which descriptions will be published in a subsequent paper. The types (or co-types) of all the new species described below are in the British Museum (Natural History).

Genus CHRYSOPS, Meigen.

Chrysops funebris, sp. n.

♀.—Length† (5 specimens) 9 to $10\frac{1}{2}$ mm.; width of head $2\frac{1}{2}$ to $2\frac{3}{4}$ mm.; width of front at vertex $\frac{3}{4}$ mm.; length of wing $9\frac{1}{4}$ to 10 mm.

Uniformly black, though the usual tufts of golden pile are present below humeral calli and on mesopleuræ; dorsum of thorax (denuded) thinly covered with greyish dust; abdomen (except a dull black area on the middle of the first segment, below the scutellum) shining, clothed above with minute, sparse, whitish hairs; wing-markings uniformly dark brown or black, distal margin of transverse band straight or nearly so; first and second joints of middle and hind tarsi yellowish white, tips of these joints usually brownish.

Head.—Frontal callus large, nearly semicircular in outline, almost touching the eye on each side, and separated from the black ocellar region by a narrow band of greyish pollen; a small patch of golden pollen between bases of antennæ (perhaps produced downwards in specimens in perfect condition); face considerably produced downwards and forwards, very protuberant, separated from the shining black jowls by a strip of golden pollen running down from the front margin of the eye; under surface of head thinly clothed

* Cf. Bezzi, Bull. Soc. Ent. Ital., Anno xxxvii. 1905, p. 234.

† The length in all cases is measured from the front of the face to the tip of the abdomen, and is exclusive of the antennæ.

with rather long yellowish hair; *palpi* hazel-brown*, *very slender*; *antennæ* slender, first joint not at all incrassated and only slightly longer than the second; second and third joints dark brown, first joint lighter (brownish tawny) except at distal extremity. *Thorax* with a tuft of golden pile on the metapleuræ, besides the tufts already mentioned. *Abdomen*: the short whitish hair clothing the dorsum somewhat longer and more conspicuous on the sides of the first and second segments than elsewhere; under side of second segment also clothed with short whitish hairs; remainder of venter inconspicuously clothed with blackish hair. *Wings* with extreme base, costal cells, basal fourth of first basal and basal sixth of second basal cell, marginal cell from a point above the origin of the third vein to the end, and a continuation (apical blotch) which fills out the apical portion of the first submarginal cell, and the upper angle of the second submarginal, shading off below, dark brown; the *proximal margin* of the *transverse band* runs from the origin of the third longitudinal vein to the posterior upper angle of the fifth posterior cell, and thence (sometimes obliquely forwards) to the sixth vein, on which it ends; the *distal margin* of the transverse band runs from a point below the second longitudinal vein, and a little beyond the level of the end of the first longitudinal, to the hind margin of the wing at the end of the vein separating the third and fourth posterior cells. Proximally, the transverse band thus fills out the extreme tips of the first and second basal cells, and the end of the anal cell; distally it includes the base of the second posterior cell, and diagonally bisects the third posterior cell. The whole of the discal cell is included, but there is sometimes a tiny hyaline fleck at its extreme base. The apical portion of the wing below the apical blotch is entirely infuscated with a brownish suffusion, and the infuscated area is separated from the transverse band by a milky streak, which ends on the vein separating the second and third posterior cells. *Halteres* dark brown. *Legs*: coxæ dark brown; femora reddish brown, tips of hind pair darker; tibiæ, except extreme tips, front tarsi, and last two joints of middle and hind tarsi dark brown; third joints of middle and hind tarsi brownish; front and middle tibiæ incrassated, hind tibiæ also somewhat incrassated.

Uganda: type and three other specimens from north-east side of Lake Albert Edward, 1906 (*Dr. A. D. P. Hodges*);

* For names of colours see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, and Company, 1886).

a fifth specimen from the shore of Lake Victoria, in Buddu, 1903 (*Sleeping Sickness Commission of the Royal Society, per Colonel David Bruce, C.B., R.A.M.C., F.R.S.*).

Of the African species already described, *Chrysops funebris* appears, so far as may be judged from the description, most nearly to resemble *C. confluens*, Lw., from the Cape of Good Hope, from which, however, it may at once be distinguished by the slender antennæ, single frontal callus, and very different wing-markings.

Chrysops silacea, sp. n.

♀.—Length (17 specimens) 8 to 10 mm.; width of head $2\frac{2}{3}$ to 3 mm.; width of front 1 mm.; length of wing $7\frac{1}{2}$ to $9\frac{1}{3}$ mm.

Head yellow; thorax black or blackish brown, with yellow longitudinal stripes; scutellum ochre-yellow, median portion of extreme base black; abdomen ochraceous, upper side marked on basal half with two longitudinal black stripes, not reaching hind margin of third segment, and sometimes not extending beyond second; distal portion of wing from base of third vein infuscated, transverse band inconspicuous, reduced to a small dark blotch extending from base of third vein to posterior upper angle of fifth posterior cell; legs ochraceous, front tarsi and tips of middle and hind tarsi dark brown.

Head rather broad, dark brown on vertex, elsewhere clothed with ochre-yellow pollen, except on frontal callus, a mark above base of each antenna, the facial tubercles, and a small dark brown spot on the jowls below each eye; frontal callus of moderate size, three fourths as wide as the front and well separated from the eye on each side, not highly polished, edged with brown at the sides or sometimes all round the upper curved margin; facial tubercles highly polished, elliptical in shape, occupying lower two thirds of face and extending nearly to margin of buccal cavity, separated from each other by a narrow stripe of yellow pollen; often only the upper portion of the pollinose stripe is present, when the tubercles coalesce below and assume the appearance of a single elongate cordate tubercle, which extends to the lower margin of the face; front, except on callus, clothed with short brown hair, densest on vertex; sides of face and lower surface of head clothed with pale golden hair; palpi lanceolate, widest part of moderate breadth, thinly clothed with minute yellowish hairs; antennæ $3\frac{1}{4}$ mm. in length, dark brown, basal portion of slender first joint tawny ochraceous. Thorax clothed with

golden-yellow pile, which is thicker and longer on the sides ; the dorsum exhibits three well-defined blackish-brown stripes, the median stripe being separated from the others by a pair of dull ochraceous stripes, which meet together in front and taper off posteriorly, where each is continuous with a broad, lateral, light yellow stripe ; the median blackish-brown stripe tapers off in front and extends to the hind margin ; the adlateral blackish-brown stripes, which are broader behind the transverse suture, are rounded off in front and behind and do not reach the hind margin ; pleuræ marked with a broad, curving, yellow pollinose stripe, thickly clothed with golden-yellow pile, commencing below the humeral callosity, encircling the upper part of the mesopleura, and extending to the metapleura ; sternopleuræ yellowish pollinose, golden yellow behind, where they are clothed with similarly coloured hair ; area between front coxæ also clothed with golden-yellow pollen and hair. *Abdomen* clothed above and below with minute orange-ochraceous hairs ; the black stripes, which commence on hinder half of first segment, vary greatly in width in different specimens, and are often somewhat irregular in outline ; they are sometimes interrupted on hind margin of first segment, and may terminate before reaching hind margin of second, to reappear as basal spots on the third segment ; lateral margin of second, and sometimes of third and fourth segments as well, narrowly edged with dark brown or black ; venter unicolorous, a small median black streak occasionally present on the second and third segments. *Wings* : costal cells ochre-yellow ; stigma ochraceous ; whole of apical portion, from a point on costa above fork of third vein to tip of anal cell, suffused with brown, including the whole of the fifth posterior cell, but not the bases of the second, third, and fourth posterior cells ; there is thus a paler, buff-coloured area between the apical blotch and the remains of the transverse band ; the latter includes the tips of the first and second basal cells and the basal third of the discal cell ; lower portion of second basal cell usually with a slight yellowish tinge. *Halteres* dark brown. *Legs* : coxæ dark brown (front pair paler), clothed with golden-yellow hair ; femora and tibiæ clothed with minute orange-ochraceous hairs ; front tibiæ somewhat incrassated, their distal portion brownish.

Congo Free State ; Southern and Northern Nigeria. Type and four other specimens from the Congo Free State (Kimwenza, 28. iii. 1904 ; Yakusu, 15. ix. 1904 ; Kimwosa,

Leopoldville, 1904; N'Kussu, Cataract Region, 25. xi. 1904: Drs. Dutton, Todd, & Christy); other specimens from Old Calabar, Southern Nigeria (*the late Miss M. H. Kingsley*); Ohumbele, Southern Nigeria, 6. viii. 1900 (*Dr. H. E. Annett*); Odut and Uwet, May 1906 (*G. C. Dudgeon*); Sapele, Northern Nigeria, 1906 (*received from Dr. G. F. Darker*); Akwacha, Bassa Province, Northern Nigeria, July 1906, January and February 1907 (*Dr. G. J. Pirie*). According to Dr. Pirie *C. silacea* is numerous at Akwacha in the dry season; and at Sapele, in Northern Nigeria, it is stated by Dr. Darker to be troublesome to human beings.

This species must not be confused with *Chrysops dimidiata*, v. d. Wulp, the wing-markings of which are identical with those of *C. silacea*, while the buff-yellow abdomen is also adorned with two black longitudinal stripes. *C. dimidiata* may be distinguished by the considerably larger and more prominent frontal tubercle, which is only narrowly separated from the eye on each side; by the paler (buff-yellow) ground-colour of the abdomen; and by the fact that the abdominal stripes are much broader and reach the fourth segment, when they either become merged in the dark brown colour of the terminal segments, as stated by van der Wulp, or meet together on the sixth segment so as to form a loop. In *C. silacea* the black stripes are sometimes so attenuated or interrupted as to be easily overlooked, and in the case of one specimen from Odut, Southern Nigeria, little more of them remains than a couple of small dark flecks on the hind margin of the first segment, and one or two indistinct markings on the second.

The range of *C. dimidiata*, which was described ('Notes from the Leyden Museum,' vii. 1885, p. 80) from Chimfino, Portuguese West Africa, evidently overlaps that of *C. silacea*, since the Museum possesses a series of specimens of the former species from Ologbo, Southern Nigeria, May 1906 (*G. C. Dudgeon*).

Eye-markings *.—In two specimens from Sapele, preserved in spirit, the occipital border is fairly broad, and in contact with the occipital margin and with the upper frontal spot, which is also connected with the frontal margin. The occipital border is also in contact with the shaft above and the arrow-head below, which are continuous with each other,

* For explanation of terms used see V. A. E. Daecke's interesting paper, "On the Eye-Coloration of the Genus *Chrysops*" ('Entomological News,' vol. xvii. 1906, pp. 39-42, pl. i.).

forming a zigzag line. The middle and lower frontal spots are somewhat narrow and in contact with the frontal margin*.

Chrysops Wellmanii, sp. n.

♀.—Length (5 specimens) 7 to $7\frac{2}{3}$ mm.; width of head $2\frac{1}{3}$ to $2\frac{1}{2}$ mm.; width of front at vertex 1 mm.; length of wing 7 to $7\frac{1}{3}$ mm.

Head wide, flattened from front to rear; face whitish grey; frontal callus, vertex on each side, and antennæ shining black; first joint of antennæ elliptical in outline when seen from above, strongly incrassate, twice the length of the second joint and, at the widest part, one and a half times as broad; thorax uniformly plumbeous above and below, without markings; abdomen varying from ochraceous-buff to tawny, brownish at the tip; wings hyaline, extreme base, costal border, and sharply defined transverse band, tapering to hind margin, blackish brown; legs, except cinereous coxæ, black.

Head.—Frontal callus shallow from above downwards, but very wide, extending from eye to eye; lower margin straight, sharply defined, separated from the bases of the antennæ by a narrow transverse band of the whitish-grey pollen which covers the face; frontal callus somewhat triangular in outline, the upper margin being produced in the centre so as to include the anterior ocellus; above the callus is a narrow band of grey pollen, in the middle line sending an offshoot to the occiput, and leaving on each side of the vertex a somewhat quadrate, shining, black area; occipital region grey; face and jowls entirely whitish-grey pollinose, without any shining tubercles, but oral margin blackish in front; face and underside of head clothed with long whitish hair; *palpi* cinereous, elliptical in outline, clothed with whitish hair; first joint of antennæ clothed with blackish hair (third joint wanting). *Thorax* clothed with long whitish hair on sides and beneath. Post-alar calli with a reddish tinge. *Scutellum* blackish, hind margin fringed with whitish hair. *Abdomen*: a somewhat quadrate dark brown patch on the middle of the first segment beneath the scutellum, shading off to the hind margin; extreme lateral margins of

* *Chrysops silacea* is the species referred to by Newstead ('Annals of Tropical Medicine and Parasitology, vol. i. no. 1 (February, 1907), p. 43, pl. iv. fig. 1) as "*Chrysops dimidiatus*, v. d. Wulp." I am responsible for this identification, which I formerly believed to be correct, and it was not until a series of the true *C. dimidiata*, v. d. Wulp, was received from Mr. Dudgeon, as mentioned above, that the error became evident.

second and lateral margins of third and following segments dark brown; on ventral side fifth and following segments usually dark brown, hinder portion of fourth segment often more or less brownish; abdomen clothed above with short yellowish or whitish hair, beneath with short whitish hair, sides fringed with long whitish hair. *Wings*: bases as well as extreme tips of first and second basal cells blackish brown; apical blotch narrow, extending from the upper end of the distal margin of the transverse band to a little way beyond the termination of the upper branch of the third longitudinal vein; distal margin of transverse band somewhat irregular, commencing on the costa a little beyond the level of the fork of the third vein, and terminating at the tip of the anal cell; in the fourth and fifth posterior cells it is somewhat indistinct, and less sharply defined than above; proximal margin of the transverse band commencing at the base of the third and running at right angles to the costa almost straight down to the sixth vein, sometimes with a slight backward projection at the upper inner angle of the fifth posterior cell; veins in hyaline area on basal side of transverse band pale (cream-colour); veins beyond transverse band also partly pale. *Halteres* brown. *Legs*: front tibiae alone incrassated, indistinctly reddish at the base.

Angola: type and four other specimens from the Chiyaka district, March 1906 (*Dr. F. Creighton Wellman*).

The species was met with in thick bush, where antelope abound, and Dr. Wellman states that it "is very agile and goes for one's eyes." When forwarding these specimens and examples of a new species of *Tabanus*, which will shortly be described, the donor wrote:—"These are probably the first insects ever collected in Chiyaka district." I am glad to be able to associate with this extremely pretty species the name of its discoverer, who, although professionally engaged in another department of science, owing to his energy and enthusiasm as a collector of Diptera has, during the last three years, enriched the National Collection with examples of many interesting new species from Portuguese West Africa.

By its remarkable coloration *C. Wellmanii* is easily distinguishable from any of its congeners known to me from any part of the world.

Chrysops Brucei, sp. n.

♀.—Length (8 specimens) 8 to $9\frac{2}{3}$ mm.; width of head $2\frac{1}{2}$ to 3 mm.; width of front at vertex $\frac{3}{4}$ mm.; length of wing $7\frac{1}{2}$ to 9 mm.

Thick-set, medium-sized, dusky species; dorsum of thorax dark brown, with grey longitudinal stripes; abdomen smoke-grey or drab-grey, with blackish markings on upper side; wings with a brownish tinge, and extreme base, costal border, an oblique transverse band tapering to a point and not reaching hind margin, and an apical blotch, intensified round ends of second longitudinal and upper branch of third longitudinal veins, dark brown or blackish brown; legs ochraceous, extreme tips of all femora and ends of tarsi dark brown.

Head yellowish pollinose, front of same colour or greyer; ocellar region usually dark brown, greyer in better-preserved examples; *frontal callus* dull black, small, separated from eye on each side by about one sixth of total width of front at that point, transverse diameter of callus about two and a quarter times its height, upper border slightly concave in middle; a transverse furrow beneath antennæ, below which the central portion of the face is somewhat protuberant; on each side of this protuberance a shining brown triangular area descending to margin of buccal cavity; a small blackish triangular fleck on the jowls beneath each eye (not always distinctly visible); front, sides of face, and under side of head clothed with fine yellowish hair, longer beneath; *palpi* of moderate size, brownish or reddish brown, thinly clothed with fine yellowish hair; *antennæ* small, first joint slightly swollen, not elongate, length of second joint about three fourths of that of first; first and second joints blackish grey above, dull tawny below; third joint blackish brown, dull ferruginous at extreme base; first and second joints clothed with blackish hair. *Thorax*: dorsum with three dark brown and four much narrower grey longitudinal stripes, also an extremely narrow, short, dark stripe above base of wing, running from lower end of transverse suture almost to postalar callus; median dark brown stripe about twice the width of the other two, rounded off about midway between transverse suture and posterior margin, and thence to hind margin in well-preserved specimens somewhat less distinct; paired dark brown stripes interrupted at transverse suture, and not extending so far forwards as median stripe; admedian grey stripes usually with a somewhat yellowish or brownish tinge posteriorly, lateral grey stripes paler, lavender-grey behind transverse suture; pleuræ mouse-grey, clothed with yellowish or pale golden hair, of which there is a tuft below humeral callus, on hind margin of mesopleura, and on metapleura. *Scutellum* greyish brown at base, with broad dull ferruginous hind border. *Abdomen*: first segment with a black median blotch beneath

the scutellum extending to the hind margin, and on each side curving outwards so as to form a black hind border to the segment reaching to the lateral margins; a small yellowish-grey triangle on the posterior margin, in the middle line, partially divides the blotch into two halves; second and third segments with a pair of large black or blackish-brown blotches, roughly quadrate in shape, with the posterior inner angles rounded off, and the outer border (at least in the case of the blotches on the second segment) emarginate; on the second segment the emarginate outer borders of the blotches run out to the basal angles, thus forming, with the corresponding markings on the first segment, an incomplete transverse band; in the case of the second segment the hinder edge of the blotches is close to the hind margin, in that of the third the drab-grey or buff-coloured hind border is usually a little deeper; fourth segment with a similar pair of blackish blotches (most distinct when the insect is viewed obliquely from behind), more or less rounded off posteriorly, but not emarginate on the outer side; fifth, sixth, and seventh segments dark brown, hind borders of fifth and sixth drab-grey, buff, or ochraceous-buff; upper surface of abdomen, especially posteriorly, clothed with minute golden hairs, lateral margins of fifth and following segments fringed with longer brownish hair; blotches on third segment covered with minute black hairs; venter mouse-grey, clothed with fine golden hair, longer than on dorsum and more erect; hind borders of segments yellowish. *Wings*: brown area at base including basal fourth to basal sixth of first and second basal cells, the tips of which are included in the transverse band; second costal cell lighter towards the tip; stigma large and well-marked, dark brown; distal margin of transverse band beginning on costal border halfway or two thirds of the distance between end of stigma and level of fork of third vein, and then running obliquely backwards with two prominences, one on third vein before it bifurcates, the other in base of second posterior cell; transverse band terminates in anal cell and does not reach sixth longitudinal vein; discal cell entirely included in transverse band, but its central portion as well as base of first submarginal cell usually lighter; in the apical blotch the *intensifications of colour round the ends of the second longitudinal vein and upper branch of the third* very conspicuous and characteristic; against a dark background the distal border of the transverse band is seen to have a lighter edging. *Halteres* dark brown. *Legs*: coxae mouse-grey; last three joints of all tarsi dark brown;

extreme tips of first and second joints of middle and hind tarsi brown; front tibiæ moderately incrassated, middle and hind tibiæ not incrassated.

Uganda: type and two other specimens from Kyadondo, 1903 (*Colonel David Bruce, C.B., R.A.M.C., F.R.S.*); other specimens from Singo, 1903 (*Col. Bruce*), Busoga, March 1906 (*Dr. A. D. P. Hodges*), and the Nile between Wadelai and Nimule, 1906 (*the late Dr. W. A. Densham*). With reference to the specimen obtained by him, Dr. Densham wrote:—"Only specimen seen; taken at an opening in the swampy river edge." I have pleasure in naming this species in honour of the distinguished investigator, whose epoch-making discovery of the cause of nagana (tsetse-fly disease of animals) laid the foundation of all subsequent work upon the ætiology and treatment of sleeping sickness and the various forms of animal trypanosomiasis.

Chrysops Brucei is not closely allied to any other African representative of its genus hitherto described. In its abdominal markings it presents a certain, though not by any means a close, resemblance to the following species; but the wing-markings (flecks at tips of second and upper branch of third vein) are alone sufficient to distinguish it from all other African species of *Chrysops* at present known.

Chrysops inconspicua, sp. n.

♀.—Length (3 specimens) 5 to $7\frac{1}{2}$ mm.; width of head 2 to $2\frac{1}{2}$ mm.; width of front at vertex $\frac{4}{5}$ mm.; length of wing 5 to $6\frac{1}{2}$ mm.

Small species, with rather broadly oval abdomen, the dorsum of which is marked with conspicuous paired black spots or transverse blotches, meeting in the middle line in front and separated by triangular interspaces; wings hyaline, with base, costal border to end of second longitudinal vein, and an oblique transverse band not extending beyond anal cell blackish brown; anal cell infuscated, a clear space in first and second basal cells near their distal extremities; legs entirely black.

Head.—Front olive-grey, jowls and sides of face chrome-yellow pollinose; frontal callus very large, shining black, shaped like an equilateral triangle, the apex including the anterior ocellus; vertex with a pair of small, transversely elongate, shining black flecks, one on each side of median line and including one of the other two ocelli; median portion of lower part of face with a single large, somewhat cordate, shining black tubercle, extending to margin of buccal cavity; no black fleck on jowls; front, sides of face, and

under surface of head thinly clothed with rather long and fine yellowish hair, longer below; *palpi* blackish, slender or of medium thickness, clothed with minute yellowish hairs; *antennæ* not elongated, first joint more or less incrassated, second joint two thirds of length of first; first and second joints dark mouse-grey, somewhat shining, clothed with rough-looking yellowish-brown hair; last joint dull brownish black. *Thorax*: dorsum with a pair of well-defined, broad, shining, blackish-brown longitudinal stripes, rounded off at each end, but not interrupted on transverse suture; these stripes separated by a broad median mouse-grey stripe, darker from front margin to a little beyond transverse suture, the darker portion with a light grey edging; *pleuræ* yellowish pollinose (lower portion of mesopleura blackish), with thick tufts of cadmium-yellow hair; dorsum clothed with fine, erect, pale yellow hair; *scutellum* dark mouse-grey, clothed with long, thin, yellowish hair. *Abdomen*: ground-colour of dorsum olive-grey, sides of first and second segments sometimes ochraceous; first segment with a blackish-brown median blotch, extending well beyond scutellum on each side; paired blotches on the four following segments roughly triangular in shape, rounded off behind, and not extending to hind margins, but sometimes transversely elongate, being produced so as to include basal angles of segments; sixth and seventh segments mouse-grey; dorsum (except on black blotches, which are covered with minute, appressed, blackish hairs) clothed with short chrome-yellow hair, most noticeable on hind margins of segments; sides of segments, from first to fifth inclusive, fringed with bright cadmium-yellow hair; venter yellowish grey, clothed with cadmium-yellow hair, basal portion of some of the segments sometimes with dark brown transverse bands. *Wings*: basal brown area in first basal cell includes the proximal two thirds; in second basal cell it may be confined to proximal third, or, if extending as far as in first basal cell, may be more or less obliterated posteriorly; proximal margin of transverse band running perfectly straight from base of third vein to inner basal angle of fifth posterior cell, thus filling out the tips of the first and second basal cells with colour; distal margin of transverse band commencing at end of second longitudinal vein and running obliquely backwards so as to include basal half of fifth posterior cell; distal margin of transverse band with three indentations, the first in first submarginal cell, above fork of third vein, the second in first posterior cell, and the third on or near vein separating fourth and fifth posterior cells; the transverse band dies away in the anal cell; trans-

verse band sometimes with lighter areas, *e. g.* in discal cell and at base of fourth and fifth posterior cells; portion of fifth vein bounding second basal cell below more or less suffused with brown; *no apical blotch*. Halteres dark brown. *Legs*: none of the tibiae incrassated.

Angola (Ochilonda, Bihé): three specimens, March 7th-9th, 1905 (*Dr. F. Creighton Wellmann*). The donor's field-note on this species is as follows:—"Taken March 7th, 8th, and 9th in the edges of bush bordering on small wet plains. Natives call it the 'antelope fly,' and state that it bites principally the duyker-bok (*Cephalophus Grimmii*)."

The slight resemblance between this species and the foregoing as regards abdominal markings has already been noted; the wing-markings, however, at once distinguish it, and it cannot possibly be confused with any other African *Chrysops* as yet described. Since neither of the three specimens available is in faultless condition, no special *type* has been selected; but the foregoing description has been drawn up from all three, which are therefore *co-types*.

Chrysops nigriflava, sp. n.

♀.—Length (3 specimens) $7\frac{1}{2}$ to $8\frac{3}{4}$ mm.; width of head $2\frac{2}{3}$ to $2\frac{1}{5}$ mm.; width of front at vertex $\frac{5}{6}$ mm.; length of wing 8 to $8\frac{1}{3}$ mm.

Cadmium-yellow, with conspicuous black longitudinal stripes; dorsum of thorax with three black stripes, middle one extending on to scutellum; dorsum of abdomen with two very broad black stripes, enclosing a narrower median stripe of ground-colour; base, costal border, and distal half of wings, from base of third vein, blackish brown, an ill-defined lighter area along posterior margin, commencing below upper branch of third vein and terminating in fifth posterior cell; anal cell (in all three specimens available) closed before reaching margin of wing; legs black.

Head cadmium-yellow pollinose; frontal callus shining black, rather narrow in the antero-posterior direction, and on each side ending on a level with outer margin of base of antenna, upper edge somewhat curved, ends rounded off, lower edge straighter; *vertex marked with a dark brown nearly circular spot*, which includes the ocelli; median tumid area of lower part of face with shining dark brown triangle on each side, apices of triangle reaching margin of buccal cavity; no dark spot on jowls; sides of face, jowls, and under side of head clothed with cadmium-yellow hair; *palpi* large, lanceolate in shape when viewed from outer side,

blackish brown and clothed with brownish hair; *antennæ* (third joint missing) black, not slender, first joint slightly incrassate and also somewhat elongate, length of second joint two thirds of that of first joint; hair clothing first and second joints black. *Thorax*: black stripes on dorsum at least twice as broad as the pair of yellow stripes separating them, which are somewhat paler than elsewhere; a dark brown stripe on side of thorax on a level with base of wing, extending from front margin to postalar callus; beneath this stripe in well-preserved specimens there is a thick fringe of cadmium-yellow hair, and the lateral yellow stripe external to the outer dorsal black stripe bears similar hair; lower part of mesopleura and pectus blackish brown. *Scutellum* yellow on sides and posteriorly; end of median thoracic stripe forming a dark shield-shaped median spot, not extending to hind margin; *yellow area on scutellum and admedian yellow thoracic stripes apparently pollinose, the ground-colour being black.* *Abdomen*: black dorsal stripes starting from a common base on front margin of first segment beneath scutellum, dividing just before reaching hind margin of this segment, and extending without interruption to the seventh segment; they approach one another on the sixth segment and almost or quite come into contact on the seventh; on the third and following segments the stripes widen out so as to reach the lateral margins; venter, except a scarcely visible black or blackish median area at extreme base on first segment, entirely cadmium-yellow without markings, clothed with short, appressed, similarly coloured hair; median dorsal stripe and sides of first and second segments clothed with similar hair. *Wings*: transverse band extending to hind margin (though lighter posteriorly), and so broad that wing may be described as blackish brown with exception of a large, semihyaline, triangular area at the base; the upper margin of this light area, which is somewhat blurred, starts at the base of the anal cell and runs obliquely forward into the marginal cell a little before the base of the third longitudinal vein; the anterior side of the light area is formed by the proximal margin of the transverse band, which runs at right angles to the costa, from the base of the third vein straight down into the anal cell; the alula, axillary cell, and apical portion of anal cell are all infuscated; lighter area in distal half of wing widest in first submarginal cell (*i. e.* below what in the case of other species would be the apical blotch), and thence progressively diminishing in width. *Halteres* dark brown. *Legs* entirely black and clothed with short black hair, none of the tibiae incrassated.

German East Africa: type and two other specimens from Nguelo, Usambara (*purchased from Hermann Rolle*).

The striking markings and coloration of this species are sufficient to distinguish it without difficulty from any other African *Chrysops* at present known.

SYNONYMICAL AND OTHER NOTES.

Chrysops tarsalis, Walk., = *C. longicornis*, Macq., as suggested by Gerstaecker (Baron Carl Claus von der Decken's 'Reisen in Ost-Afrika,' Bd. ii. Abth. 3, 1873, p. 384). Miss Ricardo (Ann. & Mag. Nat. Hist. ser. 7, vol. ix. 1902, p. 368) is mistaken in regarding the two species as distinct.

Chrysops trimaculatus, Bigot, = *C. longicornis*, Macq. Through the courtesy of Mr. G. H. Verrall, in whose collection it now is, I have been enabled to examine Bigot's type, which is a ♂, not a ♀, as stated by the author and by Miss Ricardo (*loc. cit.* p. 371).

Chrysops fuscus, Ricardo (*loc. cit.* p. 368).—The type and remainder of the original series of this species are males, not females, as stated by the author.

LXXV.—*Descriptions of Two new Species of Plecotus.*

By G. E. H. BARRETT-HAMILTON.

AMONGST the bats in the British Museum of Natural History I find two undescribed species of the "Long-ear." They may be characterized as follows:—

Plecotus teneriffæ, sp. n.

This bat resembles *P. auritus* of Britain, but has much larger wings. The colour is apparently darker, but cannot be taken as reliable from the old dried skin upon which this description is based: it is, above, near Ridgway's "hair-brown," the hair-tips lighter; below, dirty yellowish white, the dark basal portions of the hairs not evident.

The type has no skull.

The dimensions (in millimetres) of the type are as follows:—

Head and body 52; tail 45; ear from the notch 35; tragus 14; thumb without claw 6; longest digit 73; basal joint of fifth digit 35; basal joint of second digit 37; forearm 44; tibia 18.5; hind foot (without claw) 8.

Hab. Teneriffe.

The *type*, a dried skin, is No. 87. 4. 18. 1 of the British Museum collection, and was taken at Orotava, Teneriffe, by Señ. R. Gomez on the 3rd of April, 1887.

The large wings of this bat mark it as distinct from any other known *Plecotus*.

Plecotus puck, sp. n.

This bat resembles *P. auritus* of Britain and is of similar size, but has a quite distinct skull.

The *colour* of the basal portions of the hairs is everywhere dusky: the tips are, above between Ridgway's "isabella colour" and "broccoli-brown," below whitish; the upperside has a grizzled appearance.

The *skull*, as compared with Central European examples (? *austriacus* of Geoffroy), is smaller, but about equal in size to those from England. The facial region and palate are, however, narrower and the backward extension of the latter less pronounced; the auditory bullæ are larger.

The *dimensions* of the type (in millimetres) are as follows:—

Head and body 40*; tail 50*; ear 41*; ear from the notch 32; tragus 16; thumb without claw 8; longest digit 60; basal joint of fifth digit 32; basal joint of second digit 34.5; forearm 38; tibia 17; hind foot without claw 8.

The *type* is a skin, No. 5. 11. 19. 1 of the British Museum collection. It is a male taken at Murree, N. India, altitude 7500 feet, by Capt. E. T. F. Birrell, R.A.M.C., on the 20th of August, 1905.

This bat approaches more closely to European *Plecoti* than to others in the Museum from Tor, Sinai, and from Ladak. The latter are in both cases larger, in which character they agree with two from Hokkaido, Japan. They are, perhaps, referable to Hodgson's *P. homochrous*.

LXXVI.—*Description of a new Species of Monkey* (*Cercopithecus Hamlyni*) from the Ituri Forest. By R. I. Pocock, F.L.S., Superintendent of the Zoological Society's Gardens.

Cercopithecus Hamlyni, sp. n.

Skin of the face a purplish-brown hue, with a narrow whitish flesh-coloured line extending from the brow between the eyes and nostrils on to the upper lip. Ears the same colour as the face, scantily clothed with inconspicuous

* Collector's measurements from label.

speckled hairs. Head with a rather inconspicuous short and narrow pale brow-band; the rest of the head, the cheeks, and the dorsal and lateral surfaces of the body uniformly dark-coloured, the hairs being finely speckled with brownish yellow. No white on the throat or chest, the underside being for the most part of an olive-grey or brownish-grey hue. The arms and legs speckled to the wrists and ankles, but darker than the body, especially upon the upper arm and thigh, the speckling being less apparent than on the body; hands and feet for the most part black above. Tail the same colour above as below, speckled and tinted like the body in the basal two thirds of its length, with its distal third black.

The whiskers are full and directed obliquely backwards and downwards, and the coat is fairly thick and long.

Loc. The Ituri Forest.

A single living specimen belonging to the Hon. Walter Rothschild and procured from Mr. J. D. Hamlyn, after whom the species is named.

This is a very distinct species. By the analytical key to the groups of species of the genus *Cercopithecus* published in my recent monograph (P. Z. S. 1907, p. 681) of these monkeys it falls under heading "*j*"—that is to say, with the species of the *Leucampyx*- and *Albogularis*-groups; but it has not the black fore limbs and white throat of either section, and further differs from both in the uniformity in tint and speckling between the head and body, in lacking the black of the head and nape characteristic of the *Leucampyx*-group and the brighter red or yellow hue of the dorsal area of the body of the *Albogularis*-group. Finally, the peculiar white line down the centre of the face is quite unique.

LXXVII.—*A new Flying-Squirrel from Formosa.*

By OLDFIELD THOMAS.

Petaurista lena, sp. n.

A beautiful rufous species with a pure white head and under surface.

General colour above a brilliant chestnut-rufous, much as in *P. grandis*, but less dulled by black. This colour extends over the upperside of the neck from the occiput, the back, and the whole of the upperside of the parachute down to the elbows and ankles. Under surface and inner side of limbs pure white throughout or slightly tinged with yellowish. Head also pure white above and below, bounded abruptly behind by the rich rufous of the nape; a few rufous hairs forming a narrow rim round the eyes. Ears long, oval,

mostly naked, the hairs on their bases behind rufous, passing into a darker postauricular spot, which may be more or less mixed with blackish rufous. Hands white, forearms and edges of the patagial cartilage mixed rufous and white, as are also the edges of the parachute, the proportions of the rufous and white hairs varying in the two specimens. Hind feet dark rufous proximally, more or less grizzled with white terminally. Tail mixed black and rufous, the tip with a black or black-and-white tuft.

Skull, as compared with that of *P. grandis*, readily distinguishable by its much longer and narrower nasals, which are far less expanded anteriorly; the nasal opening is consequently much narrower, while of about the same height.

Dimensions of the type (measured in skin):—

Head and body 350 mm.*; tail 440; hind foot (wet) 76; ear (wet) 40.

Skull: upper length to hinder edge of parietal 68; greatest breadth 47·5; nasals 23·5 × 12·5; interorbital breadth 17·2; palatilar length 32; length of upper tooth-row exclusive of p^3 16.

Hab. Tapposha, Central Formosa.

Type. Adult female. Collected 18th February, 1907, by native hunters for Mr. Alan Owston. Original number 60. Two specimens.

This striking flying-squirrel is one of the most beautiful species ever described, owing to the wonderful contrast between the rich red body and the pure white head and underparts. The two specimens are practically the same throughout, and the skull-difference from *P. grandis*, also a native of Formosa, shows that *P. lena* is not a mere colour-phase of that animal.

LXXVIII.—*Notes on Two Species of African Freshwater Sponges.* By R. KIRKPATRICK.

MR. J. STUART THOMSON has sent to the Natural History Museum several small specimens of freshwater sponges which he collected from a pond at Valkenberg Vlei, near Cape Town. The specimens, which are in the form of crusts on the stems of rushes, belong, in my opinion, to a new variety of *Ephydatia fluviatilis*, Linn. This almost cosmopolitan species has been found in Europe, Asia, and America, but, I believe, is now recorded for the first time from Africa.

A specimen of a second species, viz. of *Spongilla cerebellata*, Bowerbank, from a pond near Cairo, has been presented to the Museum by Dr. Innes Bey, through Mr. C. Boulenger.

* Probably shrunk; the other specimen is 430 mm. in length.

S. cerebellata has been recorded from Central India. If Dr. Annandale is right in regarding this species as a form of *S. lacustris*, then the two commonest European species, *E. fluviatilis* and *S. lacustris*, have to be added to the list of African freshwater sponges, of which twenty-one species are now known.

A description of the new variety of *E. fluviatilis* is given below.

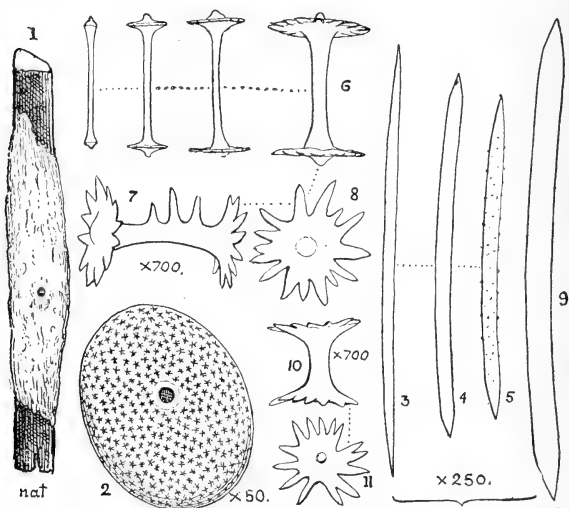


Fig. 1.—*Ephydatia fluviatilis*, var. *capensis*, on reed, nat. size.

Fig. 2.—Gemmule.

Fig. 3.—Oxea.

Figs. 4, 5.—Smooth and spined tornotes.

Figs. 6, 7.—Amphidisks.

Fig. 8.—End view of same.

Fig. 9.—Oxea of *E. fluviatilis* from Thames, London.

Figs. 10, 11.—Amphidisk from Thames specimen, side and end view.

Ephydatia fluviatilis, Linn., var. *capensis*, nov.

Sponge encrusting; colour, alive or in alcohol, of a medium brown; surface in part smooth and uniform, in part pitted and finely hirsute. Oscules scattered, level with surface, inconspicuous, about 1 to 1.5 mm. in diameter. Flagellated chambers small, oval, $20 \times 16 \mu$.

Gemmules large, oval, .75 mm. in length by .54 mm. in breadth, with funnel-shaped tube opening flush with the

surface; with thick ($10\ \mu$) chitinous inner shell and a single layer of amphidisks embedded in a vesicular layer.

Spicules: slender oxeads (fig. 3) $288 \times 8\ \mu$, curved, attenuating gradually, smooth or finely and sparsely spined; tornote oxeads (figs. 4, 5) $240 \times 12\ \mu$, smooth or finely spined.

Gemmule spicules: amphidisks (figs. 6-8) $35.6\ \mu$ long, shaft $4.3\ \mu$ thick, smooth or with one or several spines; diameter of deeply incised disks $24.3\ \mu$; with a knob at centre of disk.

Numerous developmental forms scattered in the tissues of the sponge.

Hab. Valkenberg Vlei, near Cape Town (*J. Stuart Thomson*).

There are seven specimens of this sponge, all encrusting, the largest being 5 cm. long and .5 cm. thick. The chief point of interest lies in a comparison with the typical European form. In the latter the subornote oxeads (fig. 9) are considerably longer and thicker, viz. $320 \times 20\ \mu$; the amphidisks (figs. 10, 11) are much shorter, viz. $18.5\ \mu$, with disks 21.4 in diameter and shafts 4.5 thick; lastly, the gemmules are smaller, on an average about $.36 \times .31$ mm. These differences led me at first to regard the Cape specimens as representatives of a new species, but I ultimately came to regard them as belonging to a new strongly marked variety of *Ephydatia fluviatilis*.

BIBLIOGRAPHICAL NOTICES.

Memoirs of the Department of Agriculture in India (Entomological Series). 4to. Agricultural Research Institute, Pusa. Printed by Thacker, Spink, & Co., Calcutta.

A USEFUL periodical, recently commenced under the editorship of the energetic Imperial Entomologist, Prof. H. Maxwell-Lefroy, F.E.S., F.Z.S. The following parts have already appeared:—

Vol. I. No. I. The Bombay Locust.

II. The more important Insects injurious to Indian Agriculture.

Both by Prof. Maxwell-Lefroy.

III. The Indian Surface Caterpillars of the Genus *Agrotis*. By Prof. Maxwell-Lefroy and his Assistant, C. C. Ghosh, B.A.

IV. Individual and Seasonal Variations in *Helopeltis theivora*, Waterhouse, with Description of a new Species of *Helopeltis*. By Harold H. Mann, D.Sc., Scientific Officer, Indian Tea Association.

The following is announced as in the press:—

V. The Coccidae attacking the Tea-plant in India and Ceylon. By E. E. Green, F.E.S., and Harold H. Mann, D.Sc.

Homoptera Andina: Die Zikaden des Kordillerengebietes von Südamerika nach Systematik und Verbreitung, von A. JACOBI. — I. Cicadidæ. (Abhandlungen und Berichte des Königl. Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden.) Band xi. (5). 1907. 4to. Pp. 28.

THE present work offers us a synopsis of the Cicadidæ of all the Pacific States of South America, from the southern limits of the fauna included in the 'Fauna Boreali-Americana' to Chile in the south, and to Venezuela and the Upper Amazon districts on the east.

Seventy-two species are enumerated in the present work, of which no less than forty-four are figured (occasionally with additional details) on the large double plate accompanying the paper. Eight species are represented in colour, the rest being plain, and seven species are described as new. New species, or those which have been insufficiently described, are noticed at length, but the others often very briefly. On p. 5 a useful diagram of neurulation &c. is given according to the system of Stål. Limited faunistic works like the present, especially when well illustrated, are of great value in extending our knowledge of the details of a subject so vast as Entomology. W. F. K.

Précis des Caractères génériques des Insectes, disposés dans un ordre naturel par le Citoyen Latreille. A Paris, chez Prévôt, Libraire, Quai des Augustins, et à Brive, chez F. Bourdeaux, Imprimeur Libraire. A Brive, de l'Imprimerie des F. Bourdeaux, au 5 de la R. [1796]. Pp. xiv, 208. Imprimé à 200 Exemplaires pour A. Hermann. MCCCXCVII.

WE alluded recently to a work published on the early life of the great French entomologist Latreille, who stood in a somewhat similar relationship to Cuvier as that occupied by Fabricius towards Linné. Latreille was born in 1762, and died in 1833. After his almost miraculous escape from death during the early days of the Revolution he devoted himself to entomology with great ardour, 74 entries (from 1792 onwards) figuring in Hagen's 'Bibliotheca Entomologica' under his name. The work before us is a reprint of one of the rarest of entomological books, of which only a few copies are known to be in existence; and it is also the earliest of the important series of books on systematic entomology which made Latreille's name famous. It includes the characters in French of all the genera of Insects, Arachnida, Crustacea, and Myriopoda, divided into 14 Orders. No species are mentioned, and no types are assigned even to new genera; but this omission was fully rectified by the publication (1802-1805) of the largest and most valuable of Latreille's works, his great 'Histoire naturelle, générale et particulière, des Crustacés et des Insectes,' in 14 volumes. We are glad that the numerous entomological libraries which do not possess the 'Précis' will now be able to place at least the reprint on their shelves.

INDEX TO VOL. XX.

- ABARATHA**, new species of, 432.
Abrieta, new species of, 415.
Acanthoglossus, new species of, 293, 498.
Allonotus, characters of the new genus, 29.
Amphilius, new species of, 488.
Amphipods, on some freshwater, 227.
Ancistrocerus, new species of, 85.
Andersen, K., on *Pteropus macarinus*, 351; on the geographical races of *Rhinolophus hipposiderus*, 384.
Andrena, new species of, 128.
Andrews, Dr. C. W., on the cervical vertebrae of *Zenaglon* from the Barton clay, 374.
Anomalon, new species of, 14.
Aotus, new species of, 189.
Arachnida, new, 33, 297.
Archæocidaris, on the generic name, 452.
Arnetta, new species of, 433.
Apes, on the hand and foot in man and, 155.
Aphadnus, characters of the new genus, 26.
Apobletes, new species of, 97.
Apona, new species of, 75.
Atholus, new species of, 346.
Atractylis coccinea, remarks on, 52.
Aurivillius, new species of, 4.
Austen, E. E., on new African species of *Chrysops*, 507.
Automolis, new species of, 506.
Bæturia, new species of, 417.
Barbus, new species of, 336, 486, 488.
Barrett-Hamilton, G. E. H., on two new species of *Pleocotus*, 520.
Bather, F. A., *Echinocrinus* versus *Archæocidaris*, 452.
Bathynyx, characters of the new genus, 227.
Batrachians, new, 46, 47, 109.
Birds, on the trematode parasites of British, 245.
Bolton, H., on a marine fauna in the Bristol coal-field, 375.
Books, new:—Books and Portraits illustrating the History of Plant Classification, 80; Bernard's Catalogue of the Madreporarian Corals in the British Museum, 168; Reid's *I Go A-Walking*, 295; Nature in School, 295; English's 100 Photographs from Life, 372; Lodge's 100 Photographs from Life, 372; de Nussac's *Les Débuts d'un Savant Naturaliste*, Pierre André Latreille, 372; Bordage's *Recherches anatomiques et biologiques sur l'Autotomie et la Régénération chez divers Arthropodes*, 373; The Fauna of British India, Butterflies, vol. ii., 373; Memoirs of the Department of Agriculture in India, 525; Jacobi's *Homoptera Andina*, 526; Précis des Caractères génériques des Insectes, 526.
Boulenger, G. A., remarks on Prof. L. von Mchely's paper "Zur Lösung der Muralis-Frage, 39;

- on a new engystomatid frog, 46 ;
on a new toad and a new amphis-
baenid from Mashonaland, 47 ; on
a new cichlid fish, 50 ; on new
freshwater fishes from S. Came-
roon, 50 ; on new freshwater fishes
from Angola, 108 ; on a new frog
from Angola, 109 ; on new African
species of *Barbus*, 336 ; on a new
pit-viper from Brazil, 338 ; on new
freshwater fishes from S. Came-
roon, 485 ; on new fishes from
Central Africa, 487 ; on a new
African snake, 489.
- Brachiopod nomenclature, notes on,
223 ; morphology, 376.
- Breviceps, new species of, 46.
- Browne, E. T., on the medusæ be-
longing to the family *Laodiceidæ*,
457.
- Buckman, S. S., notes on brachiopod
nomenclature, 223 ; on brachiopod
morphology, 376.
- Bufo, new species of, 48.
- Bulimulus, new species of, 491.
- Burbunga, new species of, 416.
- Cabrera, A., on three new Spanish
insectivores, 212.
- Callicebus, new species of, 161,
191.
- Caltoris, new species of, 434.
- Cameron, P., on the hymenoptera
of the oriental zoological region,
10, 81.
- Castnia, new species of, 505.
- Casyapa, new species of, 430.
- Cebu, new species of, 292.
- Celænorhinus, new species of, 431.
- Cerceris, new species of, 85.
- Cercidochela, characters of the new
genus, 284.
- Cercopithecus, new species of,
521.
- Chionæma, new species of, 76.
- Chirindia, characters of the new
genus, 48.
- Chrysops, new species of, 507.
- Cicada, new species of, 413.
- Cladomelea, new species of, 36.
- Clarias, new species of, 51.
- Clausilia, new species of, 495.
- Cockerell, T. D. A., descriptions and
records of bees, 59, 122, 445.
- Coleoptera, new, 95, 339, 423,
481.
- Colganta, new species of, 26.
- Colopus, new species of, 195.
- Copepods from the S.W. coast of
Ireland, on, 377.
- Cornillus, characters of the new
genus, 99.
- Crabro, new species of, 88.
- Crangonyx, on the sensory capsules
in species of, 231.
- Cratocryptus, new species of, 24.
- Crocidura, new species of, 197, 213,
390.
- Crossomys, characters of the new
genus, 70.
- Crustacea, new, 227, 365, 377 ; on
the, of the Channel Islands, 356.
- Cryptocotyle concavum, remarks on,
261.
- Ctenocharax, characters of the new
genus, 402.
- Ctenomys, new species of, 164.
- Cyrtogone, new species of, 8.
- Dasypus sexcinctus, on the local
forms of, 165.
- Desmacidon, new species of, 282.
- Diacrisia, new species of, 75.
- Diaphractus, characters of the new
genus, 313.
- Diplogrammicus, characters of the
new genus, 481.
- Diptera, new, 507.
- Distant, W. L., rhynchotal notes,
411 ; on a new genus and species
of *Cerambycidæ*, 423 ; on a new
species of *Cicadidæ* from E. Africa,
425.
- Drassidæ, new S. African, 297.
- Drassodes, new species of, 305.
- Drepana, new species of, 77.
- Druce, H., on new heterocera, 505.
- Druce, H. H., on a new lycænid from
Mauritius, 219.
- Dryomys, new subspecies of, 407.
- , definition of the new generic
name, 406.
- Echinocrinus, on the generic name,
452.
- Echthrus, new species of, 19.
- Eleotris, new species of, 52.
- Elliot, Dr. G., on new species and
subspecies of mammals, 185 ; on a
new species of *Cebus*, 292 ; on a
new baboon from British E. Africa,
499.
- Epeolus, new species of, 60.
- Ephydatia fluviatilis, new variety of,
524.

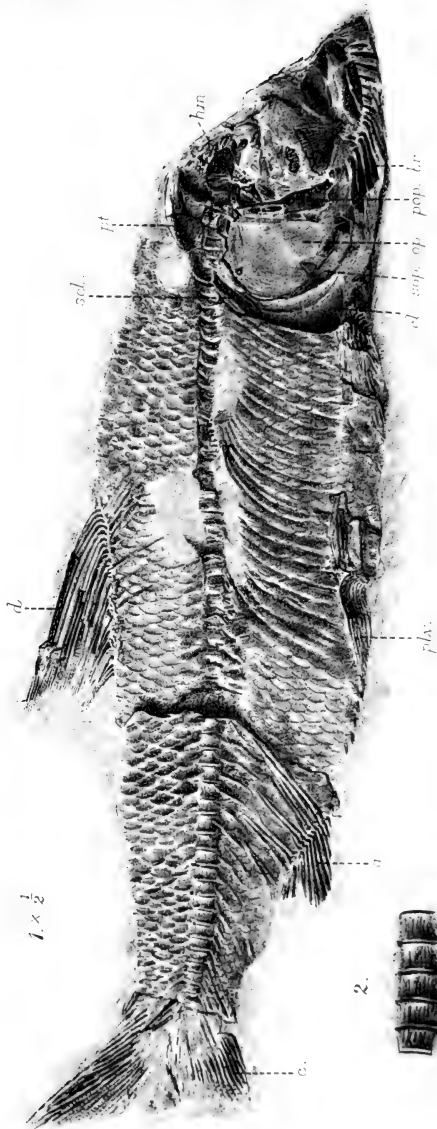
- Epiphora, new species of, 1.
 Epirhyssa, new species of, 16.
 Epitoxus, new species of, 347.
 Eretnotus, new species of, 106.
 Escharina Dutertrei, remarks on, 210.
 Eugrammicus, characters of the new genus, 99.
 Euproctis, new species of, 78.
 Eutidium, new species of, 340.
 Exosternus, new species of, 104.
 Felis, new species of, 396.
 — leo and F. concolor, on the significance of the pattern of the cubs of, 436.
 Fishes, new, 50, 93, 103, 336, 402, 485, 487.
 Fitzwilliams, Dr. D. C. L., on function and form with reference to the hand and foot in man and apes, 155.
 Fovaya, new species of, 21.
 Friona, new species of, 23.
 Gahania, characters of the new genus, 423.
 Galago, new species of, 186.
 Gammarid, on the reduction of the eye in an Irish, 227.
 Gellius, new species of, 286.
 Genetyllis, new species of, 175.
 Geological Society, proceedings of the, 374.
 Godman, Dr. F. D., on the American species of Hesperiidæ described by Plötz, 132.
 Godwin-Austen, Lt.-Col. II. II., on Helix hyba, 55.
 Goninibrasia, new species of, 4.
 Grammostethus, new species of, 345.
 Grison, new species of, 162.
 Gronoceras, characters of the new genus, 65.
 Gunomys, characters of the new genus, 203.
 Gymnophallus, new species of, 263.
 Haliphera, new species of, 81.
 Hasora, new species of, 435.
 Helicocranchia, characters of the new genus, 382.
 Helix hyba, observations on, 55.
 Henslow, Prof. G., on the xerophytic character of coal-plants, 375.
 Herpestes gracilis, on the African mongooses of the group of, 110.
 Hesperiidæ, new, 430.
 Hesperiidæ, on the American, described by Plötz, 132.
 Heteroscodra, new species of, 36.
 Hirst, A. S., on new African spiders and Solifugæ, 33; on new pill-millipedes from the Malay Peninsula and Siam, 215.
 Hister, new species of, 101, 344, 483.
 Histeridæ, new, 95, 339, 480.
 Histiea, new species of, 506.
 Holocera, new species of, 9.
 Homalopygus, new species of, 349.
 Hoplakithara, characters of the new genus, 285.
 Hylobates agilis, on the hand and foot of, 155.
 Hymedesmia, new species of, 273.
 Hymenoptera, new, 10, 59, 81, 122, 445.
 Hymenrhaphia, new species of, 274.
 Hyposolenus, characters of the new genus, 97.
 Iluza, new species of, 79.
 Imbrasia, new species of, 2.
 Imeria, new species of, 28.
 Iophon, new species of, 276.
 Iphiaulax, new species of, 10.
 Isepeolus, characters of the new genus, 64.
 Ismene, new species of, 434.
 Jameson, H. L., on a new hare from the Transvaal, 404.
 Joyeuxia, new species of, 283.
 Kirkpatrick, R., on the Monaxonellida of the National Antarctic Expedition, 271; on two African freshwater sponges, 523.
 Labeo, new species of, 108.
 Lacerta muralis, remarks on, 39.
 Lachesis, new species of, 338.
 Lagothrix, new species of, 193.
 Laodice Maasii, definition of the new specific name, 466.
 Laodiceidæ, revision of the, 457.
 Lepidoptera, new, 1, 75, 219, 430, 505.
 Leptolepis, new species of, 93.
 Lepus granatensis, new forms of, 398.
 Leucoma, new species of, 78.
 Lewis, G., on new Histeridæ, 95, 339, 480.
 Linnea, new species of, 496.
 Lissomyxilla, new species of, 275.
 Lobobunea, new species of, 5.

- Ludia*, new species of, 9.
Lydekker, R., on the name of the Armenian wild sheep, 121.
Lynx pardella, definition of the new specific name, 398.
McIntosh, Prof., on a porbeagle shark with a large suboral aperture, 169; on the young of the ling, 171; on a large example of *Ommastrephes sagittatus*, 172; on *Genetyllis citrina*, 175; on the reproduction of *Nereis diversicolor*, 176.
Macrotristria, new species of, 412.
Mammals, new, 31, 70, 113, 161, 185, 196, 202, 212, 221, 292, 293, 390, 398, 404, 406, 426, 498, 499, 500, 520, 521, 522.
Man and apes, on the hand and foot in, 155.
Mardalana, new species of, 418.
Maritrema, characters of the new genus, 265.
Marmosa, new species of, 167.
Mason, G. E., on an extinct fruit-bat of the genus *Pteropus*, 220.
Massy, A. L., on copepods from the S.W. coast of Ireland, 377.
Mastacembelus, new species of, 487.
Medusæ belonging to the family *Laodiceidæ*, revision of the, 457.
Megachile, new species of, 68.
Melampsalta, new species of, 419.
Melanocera, new species of, 5.
Melanophora, new species of, 327.
Meles, new species of, 394.
Mesostenoides, new species of, 22.
Metopa, new species of, 365.
Microlistes, new species of, 102.
Microtus, new subspecies of, 201.
Miller, G. S., on new European insectivora and carnivora, 389; on two new forms of the Spanish hare, 398; on new European squirrels, 426.
Mimagoniates, characters of the new genus, 402.
Miniopterus, new subspecies of, 197.
Mollusca, new, 490.
Molva molva, on the young of, 171.
Monaxonellida of the National Antarctic Expedition, on the, 271.
Monoplius, new species of, 103.
Mungos, new subspecies of, 113.
Murexus, characters of the new genus, 350.
Mus, new species of, 206, 501.
Mycale, new species of, 280.
Myxilla, new species of, 278.
Nacaduba, new species of, 219.
Nannocharax, new species of, 485.
Neomys, new species of, 214.
Nereis diversicolor, on the reproduction of, 176.
Nesokia, new species of, 199, 203; subdivision of the old genus, 202.
Nicol, W., on the trematode parasites of British birds, 245.
Niphargus, on the sensory capsules in species of, 230.
Norman, Canon A. M., on some British polyzoa, 207; on the crustacea of the Channel Islands, 356.
Notocrypta, new species of, 434.
Oceanapia, new species of, 289.
Octopus with branching arms, note on an, 407.
Odynerus, new species of, 82.
Ommastrephes sagittatus, note on a large example of, 172.
Onthophilus, new species of, 107.
Ophlitaspongia, new species of, 274.
Ophthalmodes, new species of, 80.
Osmia, new species of, 122, 446.
Otomys, new species of, 31.
Ovis orientalis, note on, 121.
Pachycrurus, new species of, 348.
Palarus, new species of, 91.
Papio, new species of, 194, 499.
Paratilapia, new species of, 108.
Paratropus, new species of, 349.
Parusta, characters of the new genus, 6.
Pauropsalta, new species of, 422.
Pedetes, new species of, 32.
Pedoptila, new species of, 506.
Perdita, new species of, 129.
Petaurista, new species of, 522.
Petersius, new species of, 487.
Petrosia, new species of, 290.
Phalanger, new species of, 74.
Phylactella pygmæa, remarks on, 210.
Phyllodocid, on a new, 175.
Physa, new species of, 497.
Pill-millipedes, new, 215.
Planorbis, new species of, 496.
Platyoides, new species of, 297.
Platysoma, new species of, 98.

- Plecotus*, new species of, 520.
Pleurodonte, new species of, 490.
 Pocock, R. I., on the significance of the pattern of the cubs of lions and of pumas, 436; on a new species of monkey, 521.
Polita, new species of, 490.
Polymastia, new species of, 271.
Polypus, new species of, 377.
 — cephea, note on a specimen of, 407.
 Polyzoa, notes on British, 207.
 Porbeagle-shark with a large suboral aperture, note on a, 169.
 Preston, H. B., on new land and freshwater shells from Central and South America, 490.
Probolosternus, new species of, 104.
Pronolagus, new subspecies of, 404.
Psen, new species of, 89.
Psilostomum brevicolle, remarks on, 269.
Pterinophilus, new species of, 33.
Pteropus, on an extinct fruit-bat of the genus, 220, 351.
 Purcell, Dr. W. F., on new S. African Drassidae, 297.
Putorius, new subspecies of, 395.
Pycna, new species of, 425.
Raia undulata, note on, 403.
Rana, new species of, 109.
 Regan, C. T., on two new characinid fishes from S. America, 402; on *Raia undulata*, 403.
Reithrodontomys, new species of, 163.
Reniera, new species of, 291.
Reninus, new species of, 105.
 Reptiles, new, 48, 338, 489.
Rhinolophus hipposiderus, on the geographical races of, 384.
Rhynchota, new, 411, 425.
Rhyssa, new species of, 15.
 Rothschild, Hon. L. W., on new African Saturniidae, 1.
 Russell, E. S., on the *Atractylis coccinea* of T. S. Wright, 52.
Saimiri, new species of, 190.
Sarangesa, new species of, 431.
 Saturniidae, new African, 1.
Schizoporella Alderi, remarks on, 209.
Sciurus, new subspecies of, 426.
Scotophaeus, new species of, 312.
Seminula, remarks on the genus, 223.
 Shark, on a porbeagle, with a large suboral aperture, 169.
 Sheep, on the name of the Armenian wild, 121.
Sigmaxinyssa, characters of the new genus, 272.
Silinus, characters of the new genus, 313.
Silsila, new species of, 22.
Simocephalus, new species of, 489.
 Smith, E. A., on an octopus with branching arms, 407.
Solenodon paradoxus, on the habits and external characters of, 68.
Solpuga, new species of, 39.
Spelotrema, new species of, 248.
Spharotylus, new species of, 272.
Sphecodes, new species of, 450.
 Spiders, new African, 33.
 Sponges, notes on two African freshwater, 523.
Spongilla cerebellata, note on, 523.
Staurophora, new species of, 472.
Stenogyra, new species of, 496.
Stephanoda, new species of, 490.
 Swinhoe, Col. C., on new and little-known Eastern moths, 75; on new African and Indo-Malayan Hesperiiidae, 430.
Synodontis, new species of, 50.
Tagiades, new species of, 430.
Tagoropsis, new species of, 7.
Talpa, new subspecies of, 212.
Tedania, new species of, 279.
Telicota, new species of, 433.
Terebratula, notes on species of, 225.
Terebripora, new species of, 208.
Teretriosoma, new species of, 339.
Thamnomys, new species of, 504.
Theuma, new species of, 299.
 Thomas, O., on new mammals from British New Guinea, 70; on neotropical mammals of the genera *Callicebus* &c., 161; on mammals from Northern Persia, 196; on the genus *Nesokia* and on a new species of *Mus*, 202; on the occurrence of *Acanthoglossus* in British New Guinea, 293; on a new dormouse from Asia Minor, 406; on a new *Acanthoglossus* from Salawatti, 498; on a new flying-squirrel from Formosa, 522.
Thopha, new species of, 411.
Tilapia, new species of, 50.

- Tocotrema, new species of, 257.
 Trematode parasites of British birds,
 on the, 245.
 Triepeolus, new species of, 59.
 Urabunana, new species of, 423.
 Uromys, new species of, 72.
 Vejdovsky, Prof. F., on the reduc-
 tion of the eye in a new gammarid
 from Ireland, 227.
 Verrill, A. H., on the habits and ex-
 ternal characters of the solenodon
 of San Domingo, 68.
 Vulpes, new species of, 391.
 Woodward, Dr. A. Smith, on a new
 leptolepid fish from the Weald
 Clay of Southwater, 93.
 Wroughton, R. C., on new mammals
 from S. Africa, 31; on the mun-
 gooses of the *Herpestes gracilis*
 group, 110; on mammals from the
 Bahr-el-Ghazal, 500.
 Xanthopimpla, new species of, 19.
 Xerophaus, characters of the new
 genus, 314.
 Zabromorphus, new species of, 100,
 343, 482.
 Zachresta, new species of, 13.
 Zephronia, new species of, 215.

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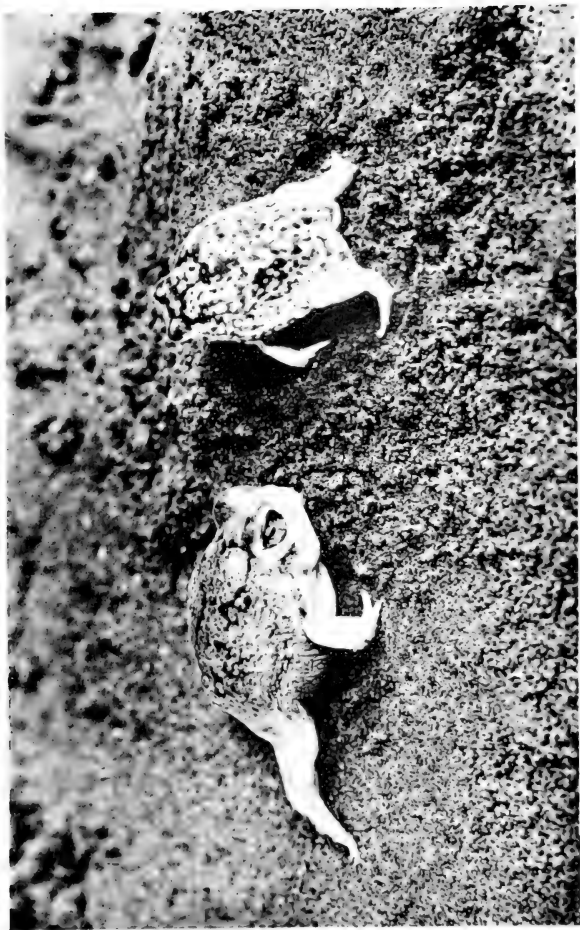
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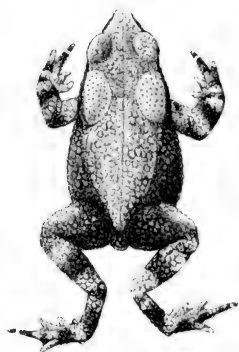
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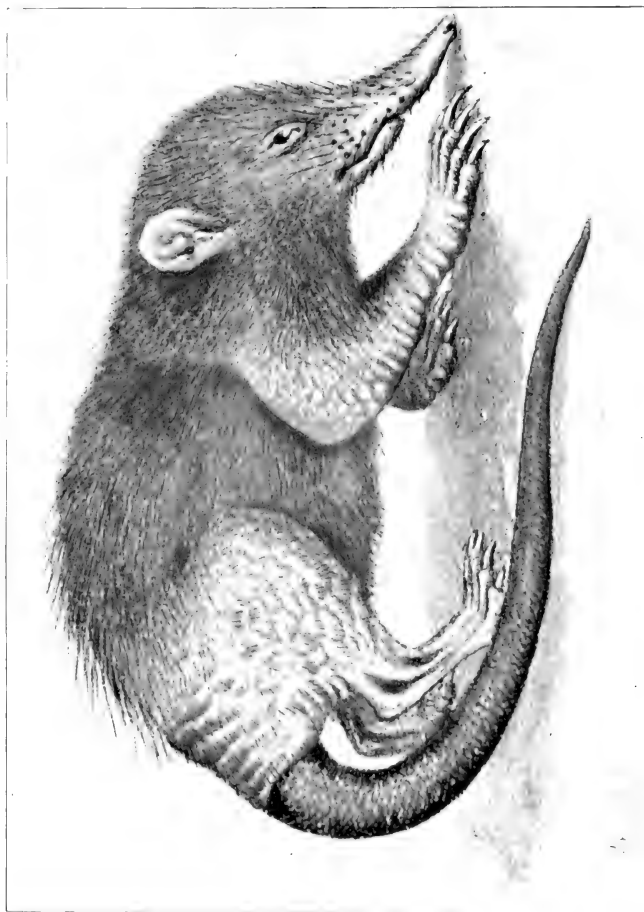
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FIG. 2.

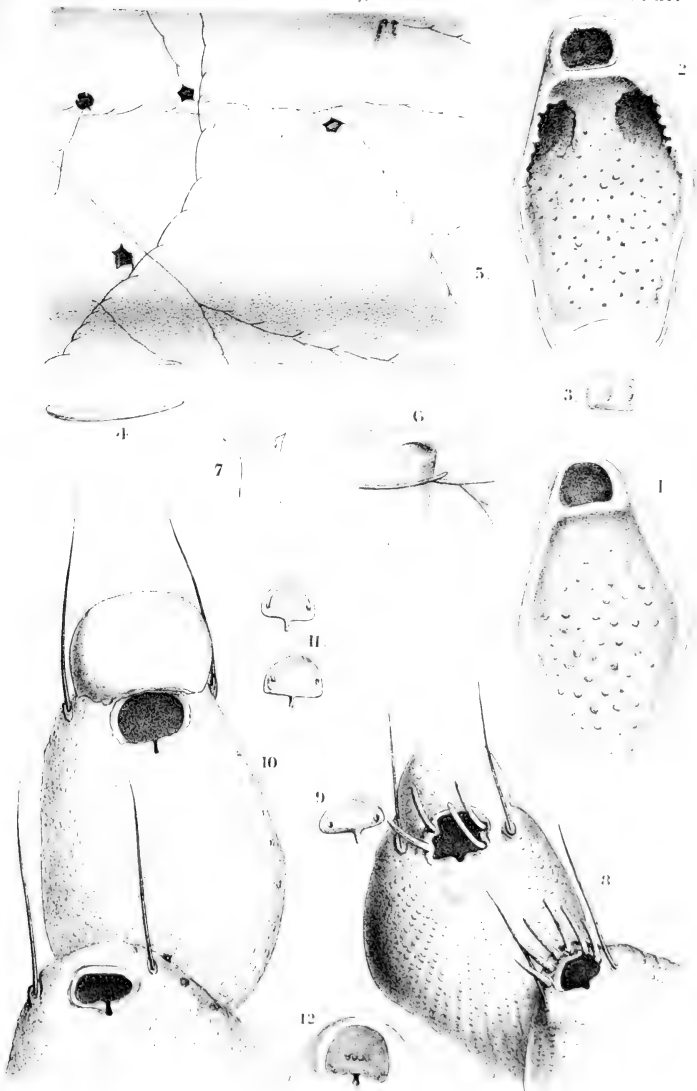


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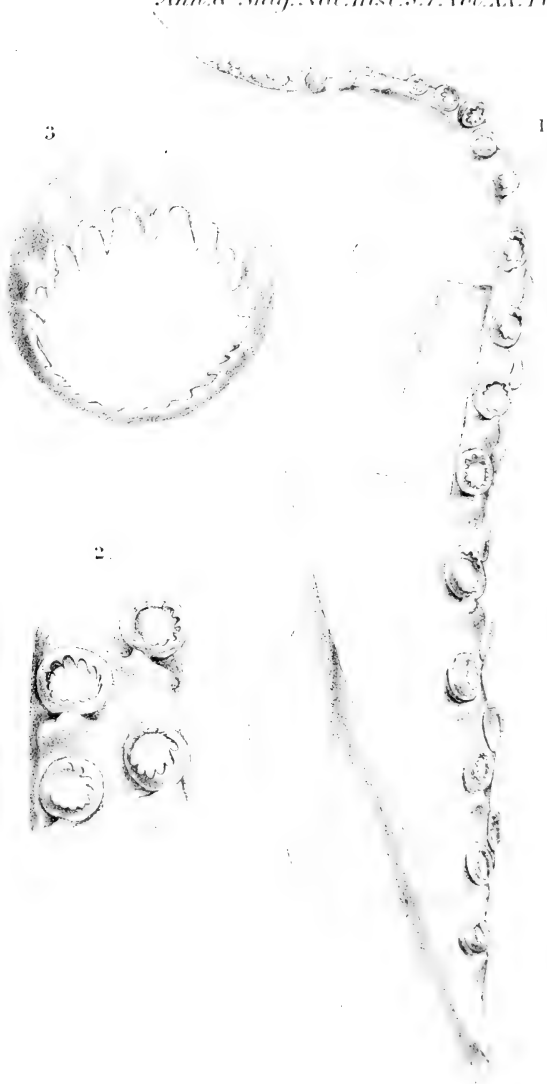
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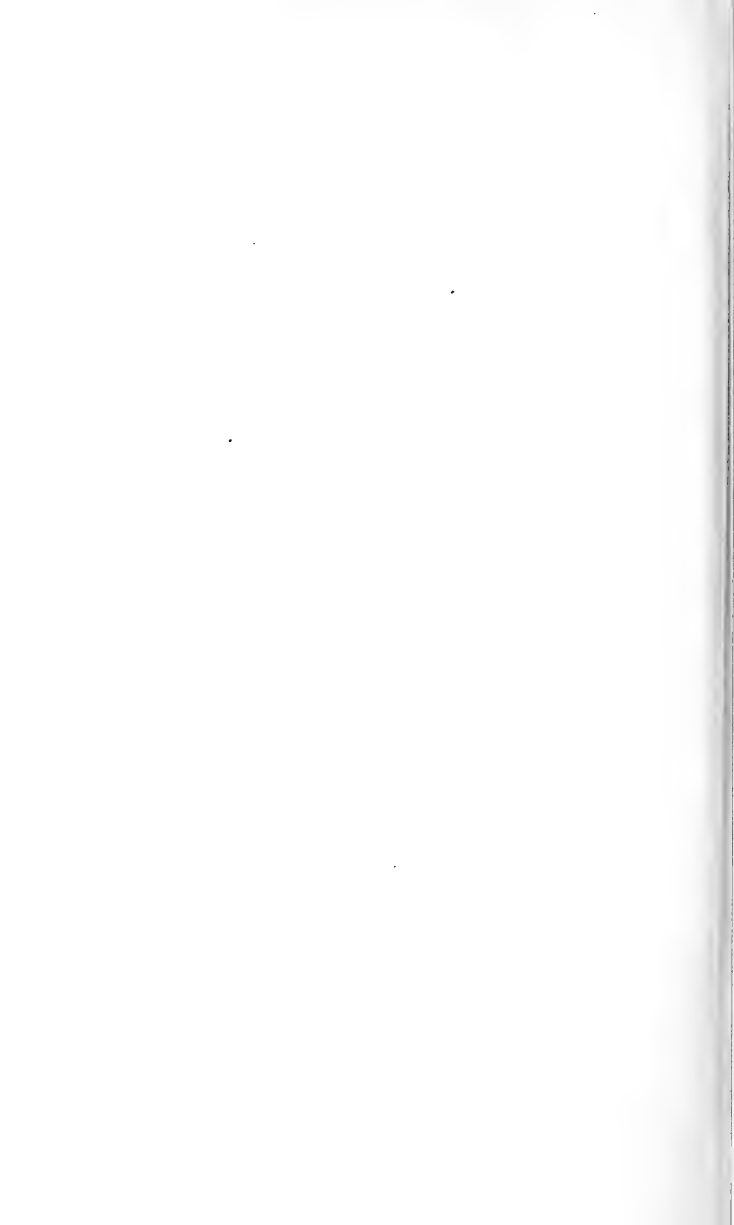


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Fig 1



Fig 2



Fig 3



Fig 4



Fig 5



Fig 6



Fig 7



Fig 8



Fig 9



Fig 10



Fig 11

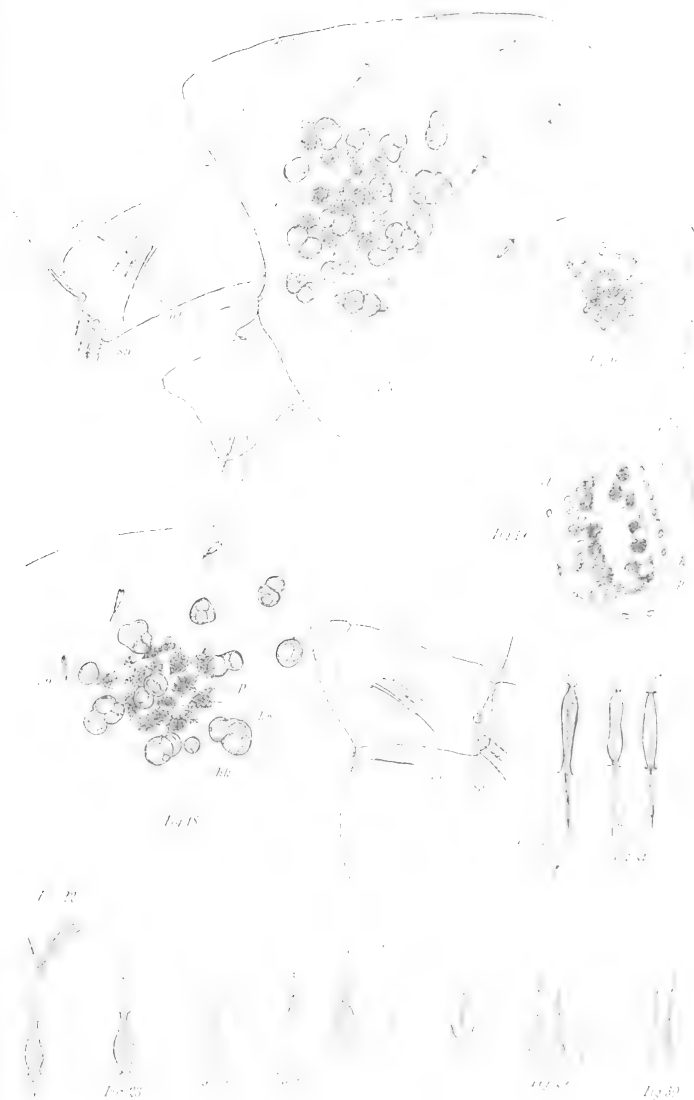


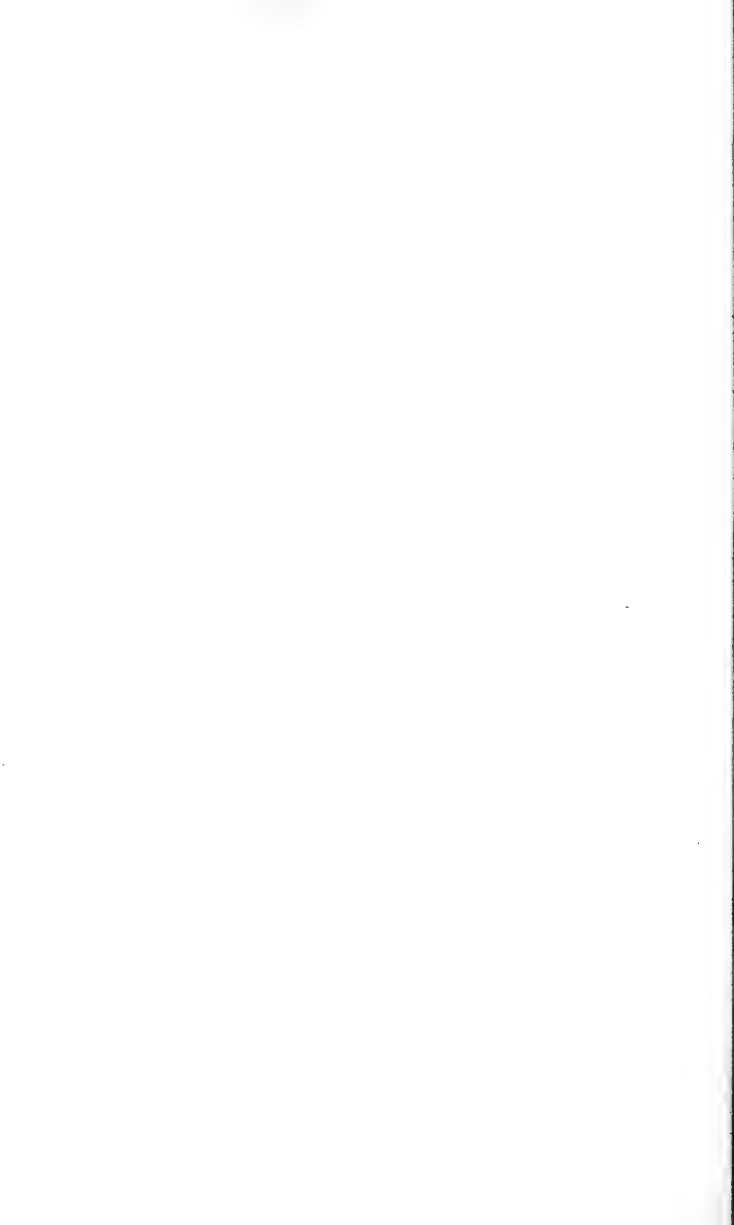
Fig 12



Fig 13









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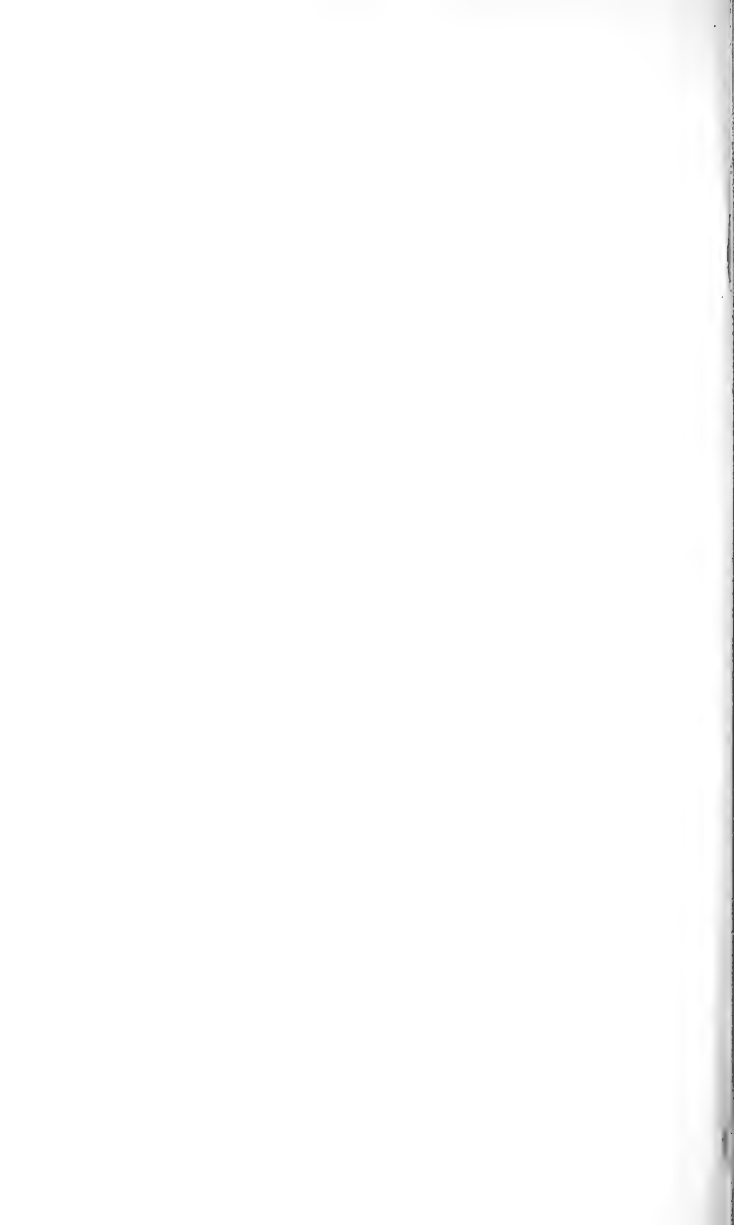
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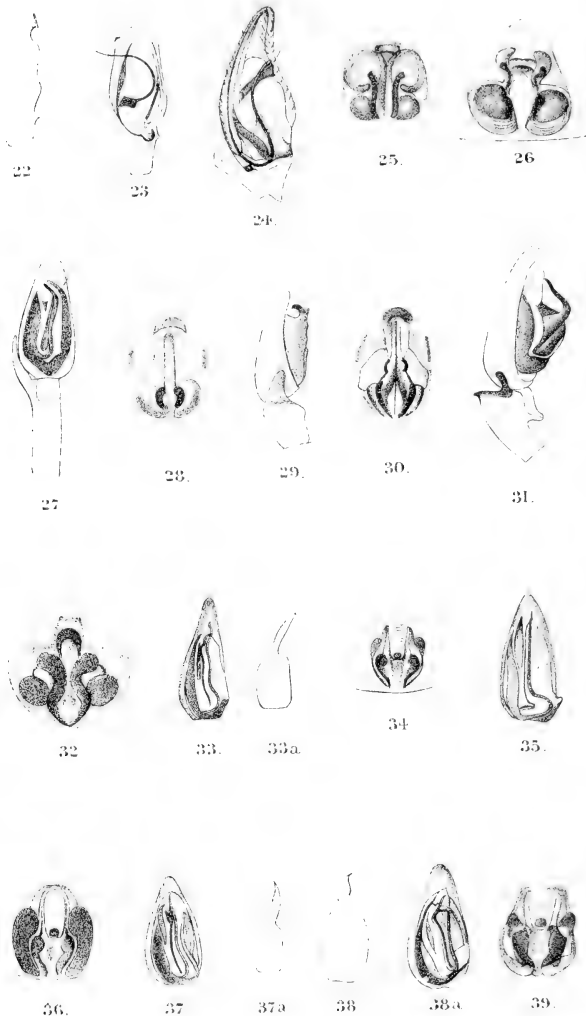


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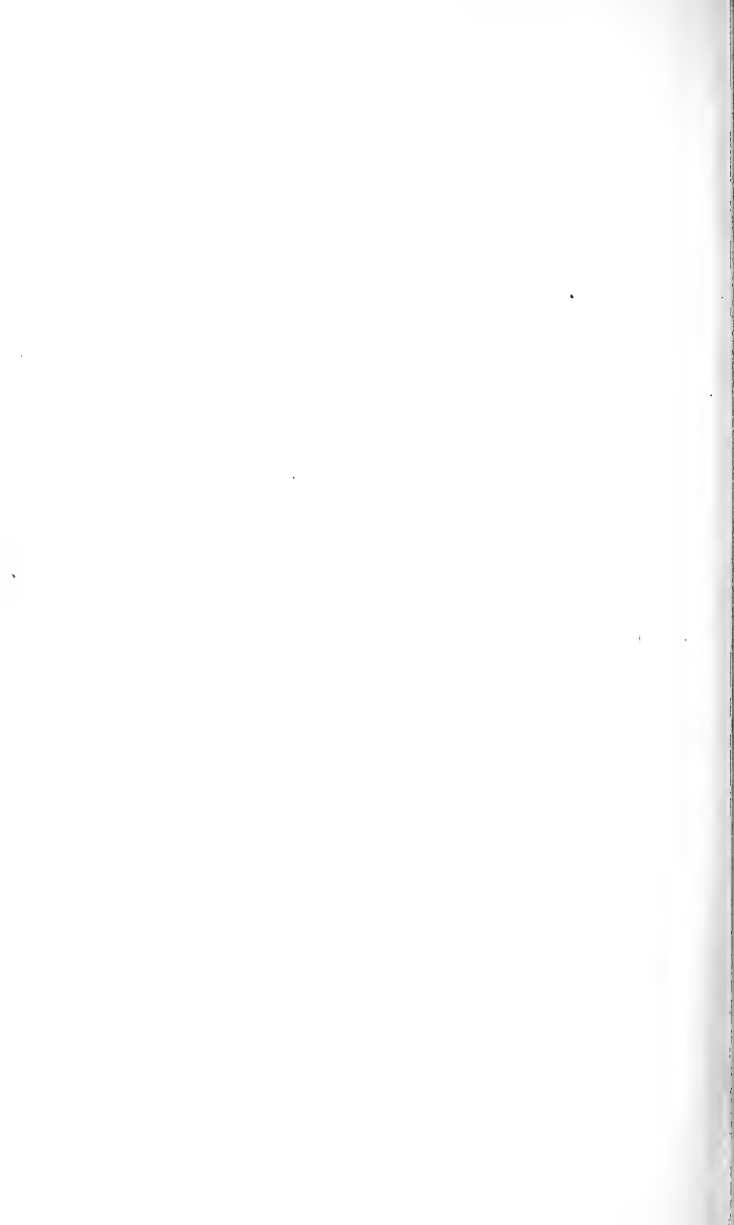
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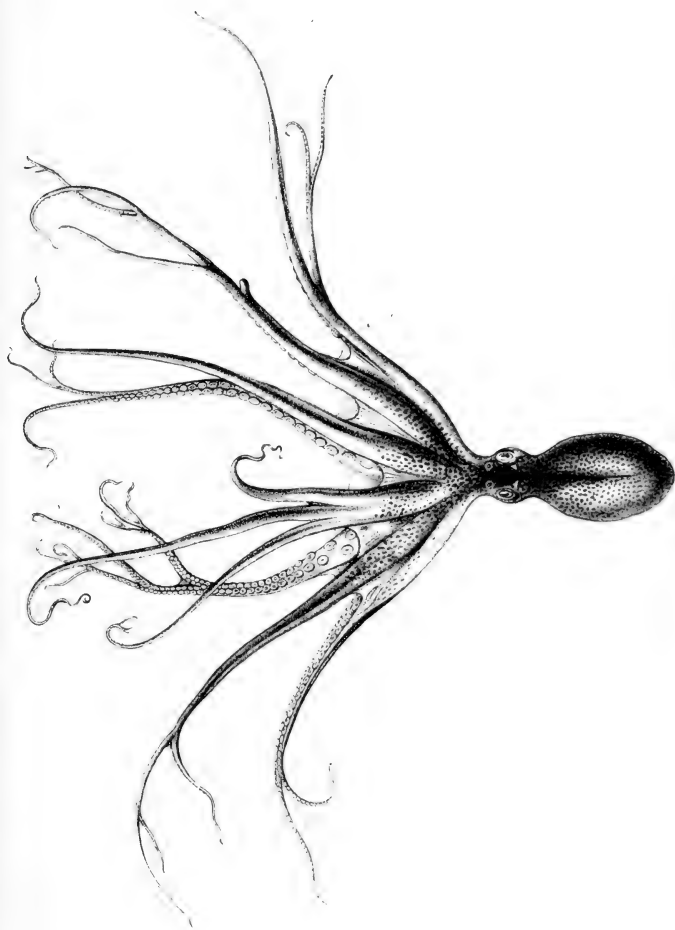
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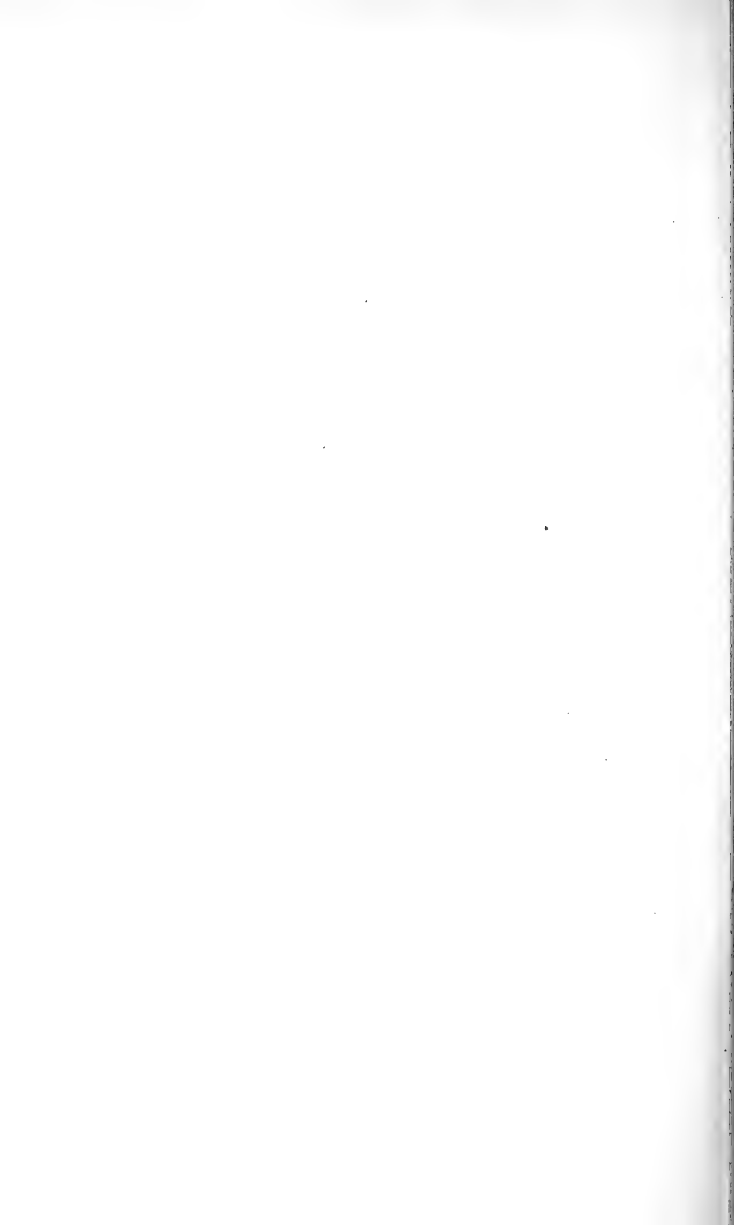




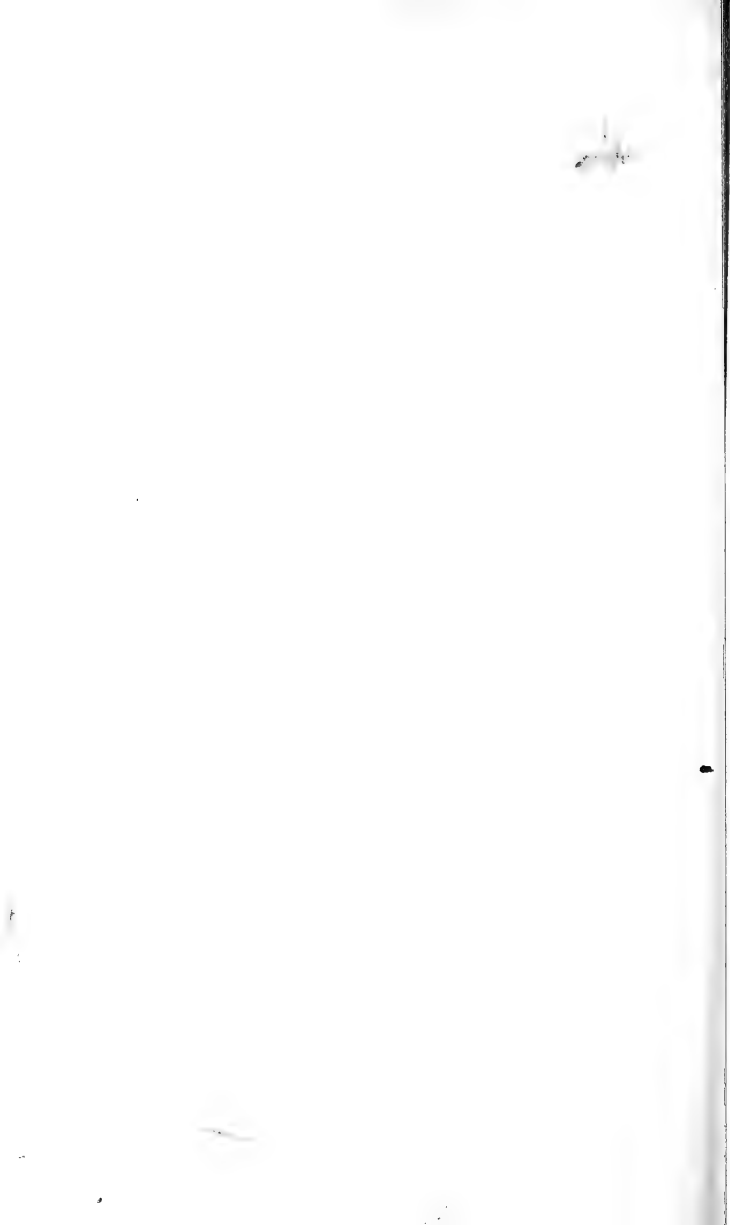
Octopus from Japan with branching arms.





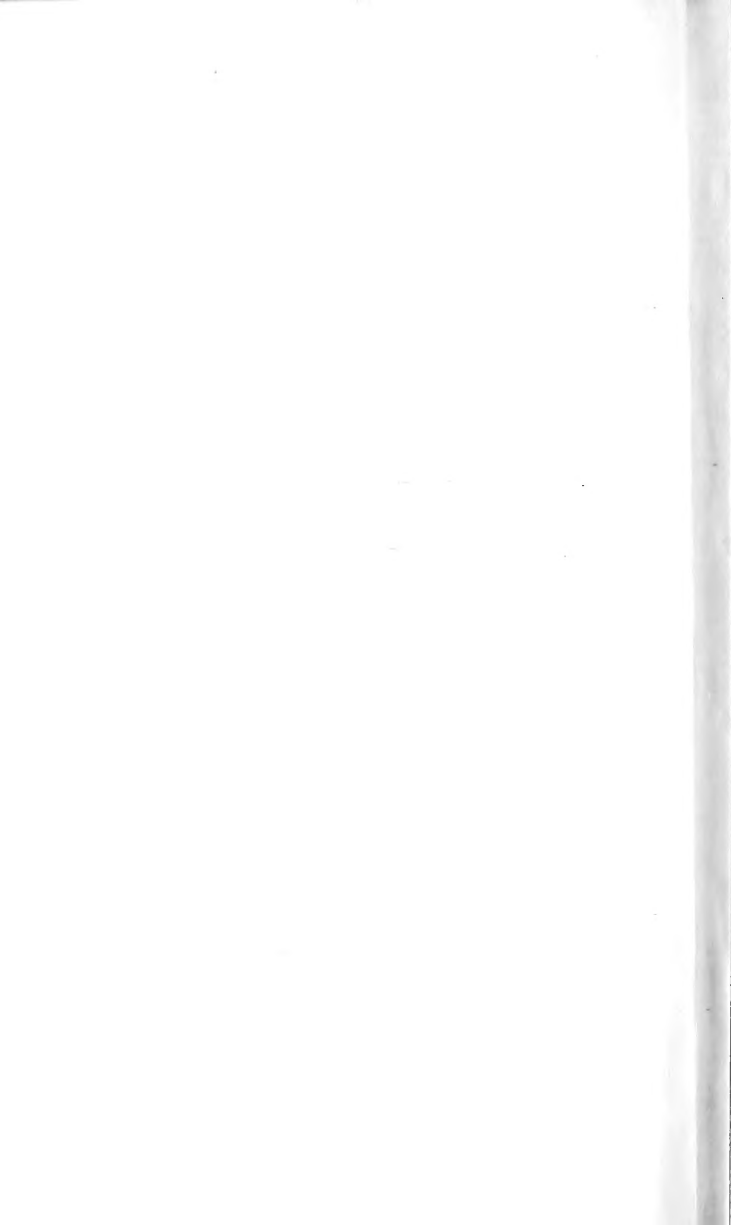












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